American Machinist

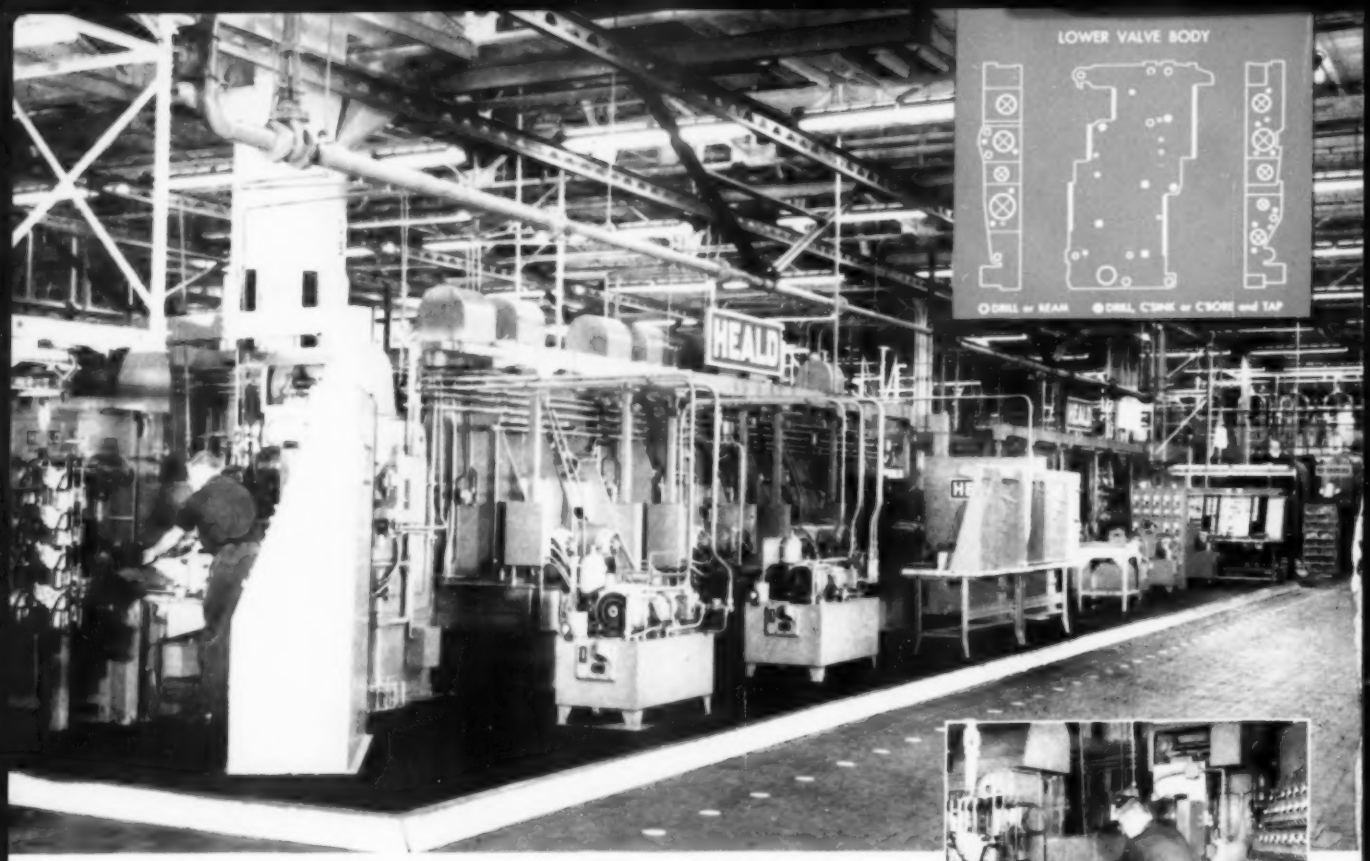
APRIL 6, 1959 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

ARE YOUR MACHINES LOAFING?

see page 117

Product simplification takes tanks from job lots to mechanized welding—see page 128



HEALD AUTOMATED LINE performs

171 OPERATIONS

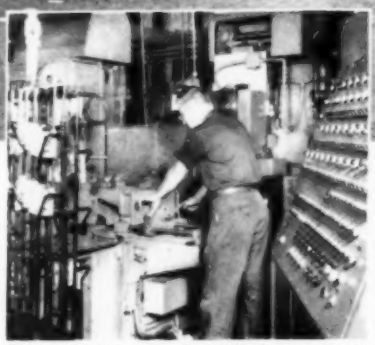
Two identical 39-station Bore-Matic transfer lines drill, bore, ream, tap, face, probe and gage 48 bores and 5 side faces of transmission valve bodies

REPRESENTING the ultimate in straight-line automation, these Heald Model S Bore-Matic transfer lines are speeding the precision production of valve bodies at one of America's leading automotive plants.

Each line consists of two 50-foot sections—a 19-station section for the small-bore and semi-finish facing operations and a 20-station section for core drilling, reaming and finish facing. A total of 171 operations (112 machining, 52 probing and 7 air gaging) are performed in a fully automatic palletized transfer line with a cycle time of 18 seconds for each station.

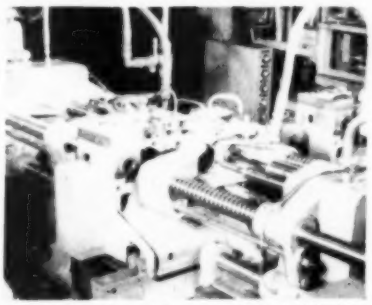
Compared to previous methods, the new Heald system results in less handling and locating of parts, fewer rejects, greater efficiency and substantially lower production costs.

For complete information on this interesting installation, send for a copy of the February 1959 issue of The Heald Herald.



Parts come to machine on overhead conveyor and are semi-automatically loaded onto the transfer pallets. Push button control console for all stations is shown at right.

Tapping and drilling operation at Station 12 of Section 1. Probing station is shown in the background.



Core drilling of spool bores at Station 4 of Section 2. Bores are then semi-finish and finish reamed and air gaged for diameter.

IT PAYS TO COME TO HEALD!

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American Machinist
METALWORKING PRODUCTION

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METALWORKING REPORT

SIGNIFICANT CURRENT DEVELOPMENTS IN TOOLING AND PRODUCTION PROCESSES

CUTTING

Make Machines Work

Five plants in the Chicago area have been setting machine speeds for a 30-min tool life or less. This has caused substantial increases in tool cost but has created startling reductions in the cost per piece.

While the makers of toolbits naturally have a special interest in using up more toolbits, the dollars and cents facts are on their side. On one job at Brunker and Goodwin tool cost went up from $1.18 a day to $7.45 a day—but the cost per piece went down from $3.05 to $0.87.

This is not an isolated example of the savings possible when you make machines work instead of letting them loaf, as you will see in the many examples starting on page 117. All of the examples have been confirmed by personal investigation by our editors.

Electrolytic Contours

Involute curves, diagonals, and spiral cuts can be made in stainless honeycomb by a new electrolytic machine that incorporates a tracer control. Developed by Ekstrom, Carlson & Co, Rockford, Ill, it extends the electrolytic method from the flat surfaces to which it is now applied to almost any contour. Further details in our next issue.

FORMING

Forged Beryllium Nose Cone

A major breakthrough in forging—the successful closed-die forging of beryllium—has been accomplished by the Wyman-Gordon Co at its North Grafton, Mass, plant. Brittleness of the metal—long a deterrent to use in rockets, missiles and high-Mach aircraft—has at last been overcome.

Until recently, excessive grain size and brittleness stymied efforts to convert beryllium into a structural material. Now, with the assistance of the Beryllium Corp of America, Reading, Pa, forging ingots or bars used by Wyman-Gordon have a grain size approximately that found in forging-quality steel.

The ductility of the as-forged material is about 6%. By heat-treatment, ductility of forged beryllium is raised to 10-12%. Now the high modulus of the material—1½ times that of steel—and its low density (about that of magnesium) can be successfully applied to space-age structural components.

Beryllium must be protected from the atmosphere while at forging heat. Inert atmosphere, cladding with another metal, or "canning" have been used. Wyman-Gordon did not reveal its method, but cladding of the billet is suspected.

HEAT TREATING

Carburizing at 2000 F

Many of the present carburizing grade steels can be treated at temperatures well above 1750 F, now considered to be the practical upper limit. Tests at Ipsen Industries, Rockford, Ill, indicate that steels such as AISI 1117, 4615, 8620 and 9315 can be carburized at a temperature of 2000 F and still retain a satisfactory grain structure, especially when a reheat hardening operation is employed. A reheating to 1500 F refined the coarse grains that formed in the core of the 8620 and 1117 test bars; no grain growth was evident in the 4615 and 9315 when carburized at 2000 F.

The increased heating rate and penetration rate at this elevated temperature will cut carburizing times considerably. This should be of special importance to captive heat treating plants, where parts are treated on a mass production basis, and to commercial heat treaters who do a great amount of carburizing. Suitable furnaces are already on the market. Further investigation will center on the cooling rate, atmosphere control, and control of temperature gradients in the furnaces. (A similar technique, employed in Europe prior to World War II and still used successfully, was outlined by John Obrebski (*AM*—May 5 '58, p74) in a letter entitled Accelerated Carburizing.)

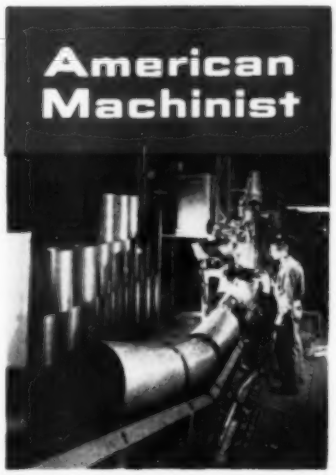
INSPECTION

"Cyclops" Checks AEC Castings

Largest-capacity radioisotope machine installed to date is checking stainless-steel castings with walls 4-12 in. thick at Cooper Alloy Corp, Hillside, N J. Unit, built by Picker X-Ray Corp, will handle a Cobalt 60 source of 1500 curies—with penetrating power equivalent to a 2-megavolt X-ray unit. Film is placed inside casting, then operators position head outside casting wall. Head is con-

CAUTION

These pages are not a synopsis of this issue of American Machinist. Major articles are described briefly in the Contents page. Because the Trends pages are classified by subject, they are not described anywhere else. Most of the developments in this department are so new that further information is not yet available—when it is, you will find a page reference to the article.



COVER:

Mechanized welding of tanks at the new Westinghouse plant in Athens, Ga. Details on page 128.

trolled from outside concrete blockhouse to expose the irradiated element a desired time length. Cobalt 60 has a half-life of 5 yr, so it is exposed to radiation at 5-yr intervals to keep it active.

Radiography competes with conventional X-ray in high-power ranges; shows advantage in less expensive installation.

TV Camera "Sees" Sound . . .

By use of sound waves at ultrasonic frequencies, a television camera developed in England can see inside engineering components, mechanisms, and the human body, as well as under water. Sound waves, which carry speech and noises through air and water, and which also are now widely used for inspection, cleaning, and machining, can be focussed with "lenses." Images of objects exposed to these sound waves can be formed and reproduced at a distance.

The ultrasonic television camera has a sound-sensitive image-receiving surface. This surface is provided by a slice of crystalline quartz. Under the impact of sound, the quartz develops on each point of its surface a voltage proportional to the ultrasonic intensity.

WELDING

Titanium Airplanes

Welded fuselage components made of strong, lightweight titanium alloy have been produced, employing arc welding, arc spotwelding, and resistance spotwelding.

Working under an Air Force contract, Boeing Airplane Co (Seattle, Wash) has developed techniques for welding the heat-treatable 6A1-4V titanium alloy and has applied the techniques in fabricating a forward body component and an aft body component.

For arc welding, the best combination was the Tig (tungsten inert-gas) process with helium shielding and, usually, A110AT (5A1-2.5Sn) filler metal. Tig spotwelding worked best with helium shielding, top and bottom, and controlled current decay plus filler metal.

ASSEMBLY

Why Metals Bond to Ceramic

National Bureau of Standards has been researching the real reason why metal-ceramic bonds form—to create understanding that may help in developing stronger bonds. Tests with gold and fused silica have indicated that the bond is not mechanical, but chemical. A radioactive isotope of gold, Au^{198}, was applied as a tracer to see how far gold gets into the ceramic surface. It appears that the gold diffuses into the ceramic, then a strong chemical bond forms between the outside gold and the gold-enriched layer of silica. This basic research may lead to improved high-temperature ceramic coatings for metals (jet engines, missiles) and better enamel finishes on stoves, refrigerators.

Redesign Puts Tanks on a Line

High-speed and less expensive production is possible on steel tanks for power-distribution transformers because the product has been redesigned drastically by Westinghouse. Actually, tank shapes are about the same, but various sizes have been much simplified and standardized. With only a limited number of diameters and heights now running, this job-shop operation has been converted to highly mechanized line production—most assembly operations are welding. See page 128.

FINISHING

No Dead-End Problems

The rapid settling tendencies of the new acrylic lacquers now being used by General Motors introduced a serious problem when spray guns were not in constant use. In the conventional setup, as many as 20 hoses may be connected at each spray booth, each carrying a different color, and in some cases an individual hose may not be used for an hour or more. Although paint is circulated through the main piping system, the direct lead to the gun remains dead and the paint settles. When the gun is put into use, the unsettled paint flows first, followed by a surge of settled material, and finally by true color material.

The old method of overcoming the problem was to drain off about half a gallon of paint into a pail before using the color, but this was not a satisfactory solution. Now, GM engineers have added a low-pressure return line to eliminate the dead end. High-pressure paint in the main line passes through a reducing valve to the gun hose which is capable of carrying more paint than the gun can use. The excess flows back through a small-dia hose to a booster pump that returns it to the main tank. In this way the paint in the "dead" line is in constant circulation.

The two hoses are connected to the gun by a Y connection that attaches to the gun nozzle. The smaller size of the return hose is designed to induce a pressure drop and reduce the flow of paint after it has passed the gun and so avoid robbing the main circulating lines in the first few stations.

Solderable Magnesium

The weight advantages of magnesium for electric and electronic gear have now become available through a new process developed by Brooks & Perkins for tin plating the metal to permit solderability. The process involves copper plating, followed by tin plating. Parts are then dipped in oil at 450 F to fuse the tin and bridge over all microporosity in the copper. Soldering can be performed in the conventional manner and is said to be easier than on steel or copper.

MATERIALS HANDLING

Changed Approach

Considerable savings in floor space are possible by taking advantage of the latest developments in materials handling. Discussion of this need at the recent SAE National Production Meeting brought forth the fact that magnetic lift-type conveyors simplify the problem of moving parts up and overhead so that fabricating or subassembly work can be accomplished outside the final assembly area. Under-floor conveyors, another space saver, are usually used for chips or trimmings, but are equally applicable to moving finished parts.

Power and free conveyors make it easy to use ceiling areas for in-process storage. Light-weight operations, such as washing, drying, and painting can be done in ceiling areas. AC Spark Plug recently saved 1200 sq ft in an air cleaner line by moving drying operations overhead. Plym-

THE OUTLOOK

Production of metal goods moved up 2 points in March to 168 on American Machinist index and probably will continue to rise slowly during second quarter. Industrial machinery demand is stronger and should gain further. *For details, turn to page 111.*

METALWORKING REPORT . . .

outh recently saved nearly 100,000 sq ft of floor space by putting the baking ovens for an assembly plant on the roof. Premium for installing the ovens on the roof was less than 10% of the cost of a conventional addition to the plant.

Speedy Pallet Loader

Three separately powered units—stacker, pusher, and taper—make up an automatic pallet loader recently introduced by Lathrop-Paulson Co. The system, which requires no operator, is said to cost less than half as much as conventional pallet-loading machines. And the compact units, which occupy less than 80 sq ft of space, can handle 30 cartons/min.

Here's how the system works: Cartons off the production line are assembled in the stacker, then transferred to a conveyor that leads to the pallet. When three stacks of cartons have been transferred to the conveyor, the pusher automatically pushes them onto the pallet. Before a fork truck removes the loaded pallet, an automatic taper, synchronized with the stacker and pusher, applies a strip of pressure-sensitive tape to the top layer of cartons on the loaded pallet. Taping the top layer prevents cartons from shifting.

MATERIALS & COMPONENTS

Fatigue at High Strength

Retained austenite in the matrix of high-strength steels lowers fatigue strength, according to experimental results of recent National Bureau of Standards research. Results also showed that fatigue stressing transforms retained austenite to untempered martensite, which probably causes the weakening effect.

Processing of high-strength steel should benefit from these findings, which were made during study of four different low-alloy steels having carbon contents ranging from 0.44% to 1.06%. Steels for critical parts such as tools, dies, missile casings, and aircraft structures should benefit.

Beryllium Toxicity

Toxicological effects of beryllium and information on precautionary measures necessary to machine, roll, forge, weld, and do other manufacturing operations normal to producing beryllium parts are available in a quarterly progress report by the Manufacturing Methods Division of AMC Aeronautical Systems Center, Dayton, Ohio.

Report emphasizes that proper recognition of the hazards of this material combined with an understanding of the basic principles of industrial hygiene necessary with beryllium operations should result in safe handling of this important engineering material. *At present, many companies are working beryllium, using correct procedures, without harmful effects.*

Protect Plastics Against Weathering

Weathering, one of the most serious problems with many plastics used outdoors, and largely caused by the ultra-violet wave lengths in sunlight, may have been solved. Geigy Company, Rhodes, Manchester, England, claims to have developed a chemical compound which protects plastics against the harmful effects of ultra-violet light.

Reported tests indicate the compound will protect polystyrene while improving its clarity; it will improve the light-fastness of polyvinyl chloride and will give polyester glass-fiber laminates better color retention and clarity. Also, the compound improves the color of some grades of polyethylene.

Stability to both light and heat is said to be excellent. Experiments indicate that the compound can be used in coatings to protect the surface beneath the coating as well as the coating itself.

Effectiveness results from additions in quantities of less than 1%.

MANUFACTURING CONTROL

Replace for Cash Flow

Overhaul present equipment? Purchase new? Purchase used? Acquire by transfer? How should you determine replacement needs? General Electric's Manufacturing Laboratory has come up with a new, simplified, Machine Tool and Equipment Evaluation Guide designed to supply an answer. This one-page form, properly completed, presents a graphic comparison of the costs involved in equipment replacement. Final result of the analysis shows the effect of the proposed equipment on cash flow, including the number of years necessary for capital recovery.

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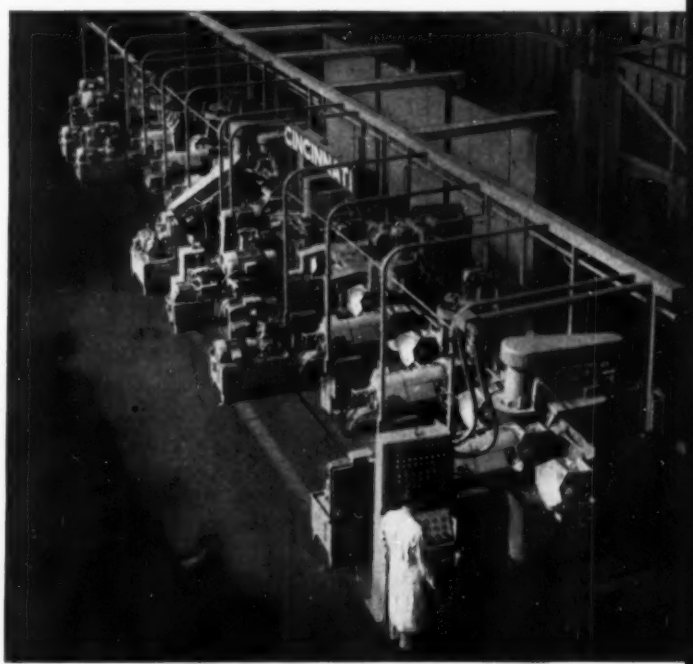
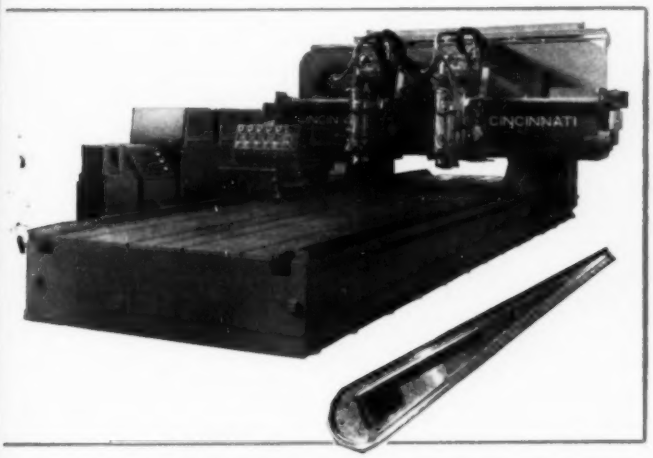
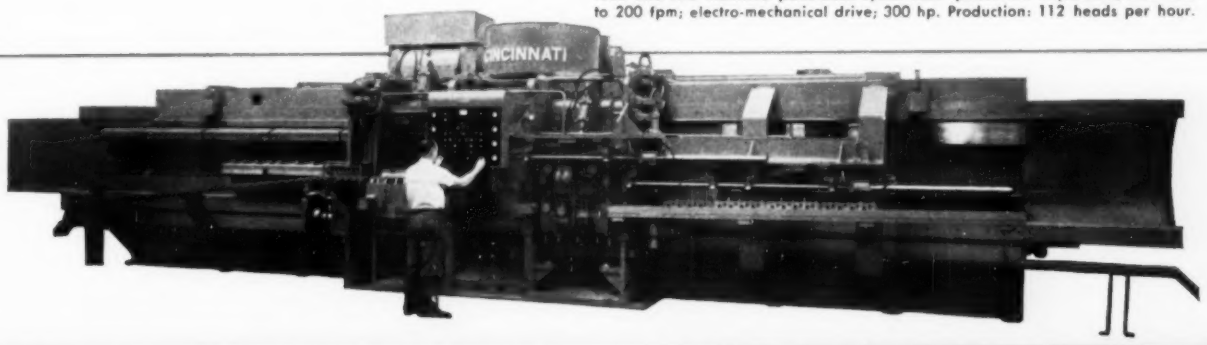


CINCINNATI 26-Station Unit Type Transfer Line. This efficient production line automatically mills, drills and bores transmission cases in 33 operations; inserts two bushings; banks excess parts; transfers the castings from one station to the next. Features include unit construction; one station for future engineering changes; complete static electrical control. Accuracy and finish obtained are excellent. The line cycles at the rate of 137 per hour.



Large Numerically Controlled Milling Machine, developed and built by the Special Machine Division to mill aluminum aircraft components. Many parts of this type, one of which is illustrated, are milled in 1/5 the time usually required. The machine is a gantry type, having fixed table measuring 8 ft. x 30 ft.

Below: **CINCINNATI Horizontal Hydro-Broach Machine,** typical of the many designed and built for the automotive industry to broach cylinder heads and blocks. The machine illustrated broaches cylinder heads on the top, joint face and two manifold pads each cycle. Ram speeds are adjustable, from 100 to 200 fpm; electro-mechanical drive; 300 hp. Production: 112 heads per hour.



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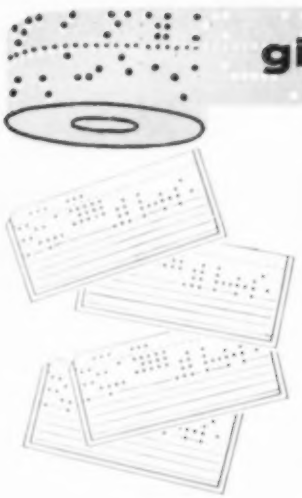

No more "cut and try" for machining operations. No change in setup for rough and finish cuts, new and reground cutters, right- and left-hand parts. No operator fatigue near the end of the shift. These are some of the ways in which Cincinnati Numerically Controlled (CNC) Machine Tools give you positive cost control at the machine.

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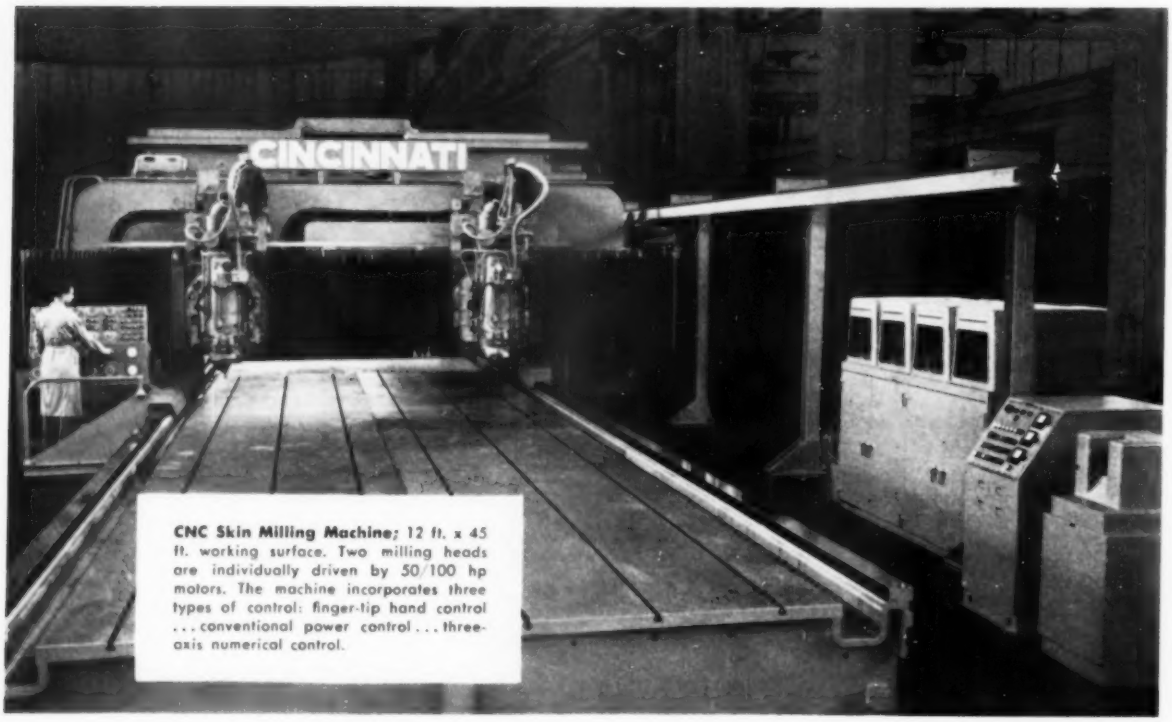

CNC Skin Milling Machine; 12 ft. x 45 ft. working surface. Two milling heads are individually driven by 50/100 hp motors. The machine incorporates three types of control: finger-tip hand control . . . conventional power control . . . three-axis numerical control.

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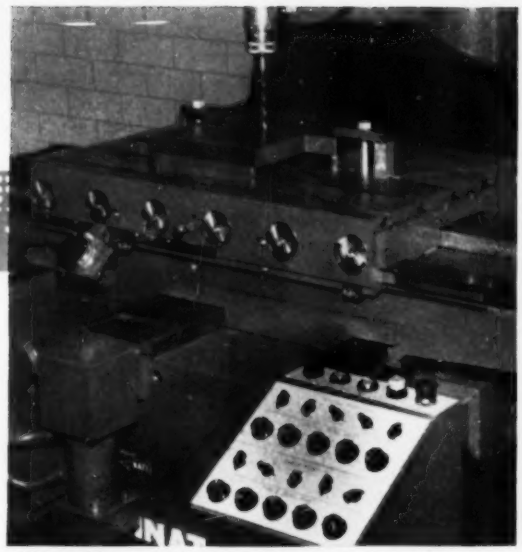
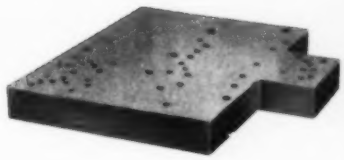
Control

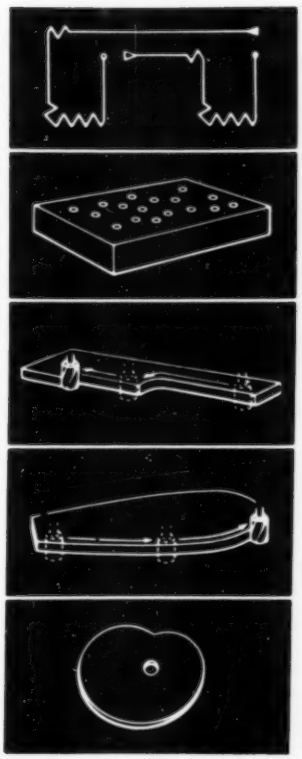
at the machine



CNC position control. Drilled holes in the part (left) are accurately spaced without benefit of a jig or time-consuming positioning on the machine table.



PRINCIPAL AREAS OF APPLICATION FOR CNC



SEQUENCE CONTROL

CNC assures reliable automatic selection of feeds, speeds, spindles, coolant flow and other auxiliary machine functions.

POSITIONING

Tool-work positioning is fast, accurate. CNC eliminates need for expensive jigs, fixtures; reduces setup time.

STRAIGHT LINE CUTS

Multiple straight line cuts to exact length, and with abrupt changes in direction, can be programmed, set up and run in a fraction of the time required using conventional methods.

CONTOURING

CNC greatly reduces lead time in reproducing complex, contoured parts; eliminates need for expensive templates, masters.

CAM MILLING

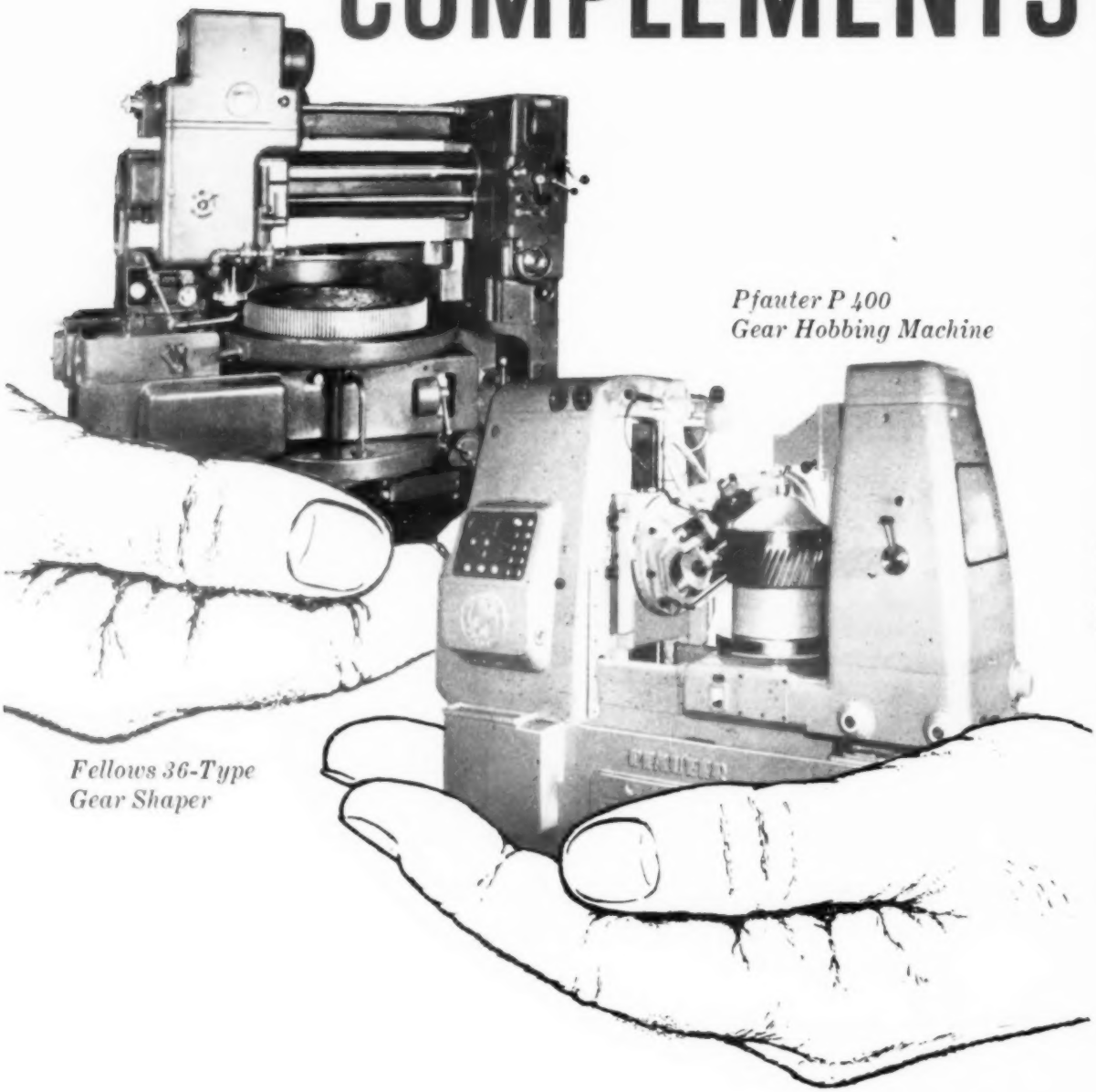
Fast, extremely accurate machining of master cams is assured on CNC controlled machines. CNC system of parabolic interpolation greatly simplifies programming of cam contour.

• PRODUCTION LINES • METAL FORMING, HARDENING MACHINES

CINCINNATI®

CIRCLE 173 READER SERVICE CARD

PERFECT COMPLEMENTS



Pfauter P 400
Gear Hobbing Machine

Fellows 36-Type
Gear Shaper

THE
PRECISION
LINE

. . . ✓ FELLOWS GEAR SHAPERS!
✓ PFAUTER GEAR HOBBERS!

Now Fellows sells, and later will manufacture, the world-famous Pfauter Gear Hobbing Machines and Worm Milling Machines.

Fellows Gear Shapers and Pfauter Gear Hobbers provide complete coverage of modern gear production equipment needs. Both operate on the molding-generating principle. The Pfauter Hobbers embody every important advance in hobbing technique, in most cases originated by Pfauter. And Fellows Gear Shapers incorporate every major advance in gear production by the Gear Shaper method originated by Fellows.

Among the many features incorporated in Pfauter Hobbers are the differential for helical gear hobbing, the hydraulic backlash eliminator for efficient climb hobbing, the fully automatic plunge for longitudinal and radial-tangential hobbing and, most recently, exclusive Pfauter DIAGONal Hobbing. Capacities of Pfauter machines range from 3" max. P. D., $2\frac{3}{4}$" max. face width, to 120" max. P. D., $1\frac{1}{4}$ D. P. and 30" max. face width.

With the addition of the Pfauter line, Fellows provides the most comprehensive service possible in the field of gear production equipment. Your Fellows representative can give you full information about our machines and instruments which cover every phase of gear production.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Avenue, Royal Oak, Mich.
150 West Pleasant Avenue, Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Avenue, Los Angeles 45

Fellows *Gear Production Equipment*

How to SAVE TIME in your threading operation

Plants throughout the world save valuable time in their threading operations using Landis Machine Company Threading Equipment. For example:

A LANDIS ALT COLLAPSIBLE TAP produces coarse pitch threads in less than a minute in one pass at the Holys Manufacturing Co., Forest Park, Ill. The ability of the LANDIS Tap to tap large diameter coarse pitch threads requiring heavy metal removal *in one pass* reduces threading time.

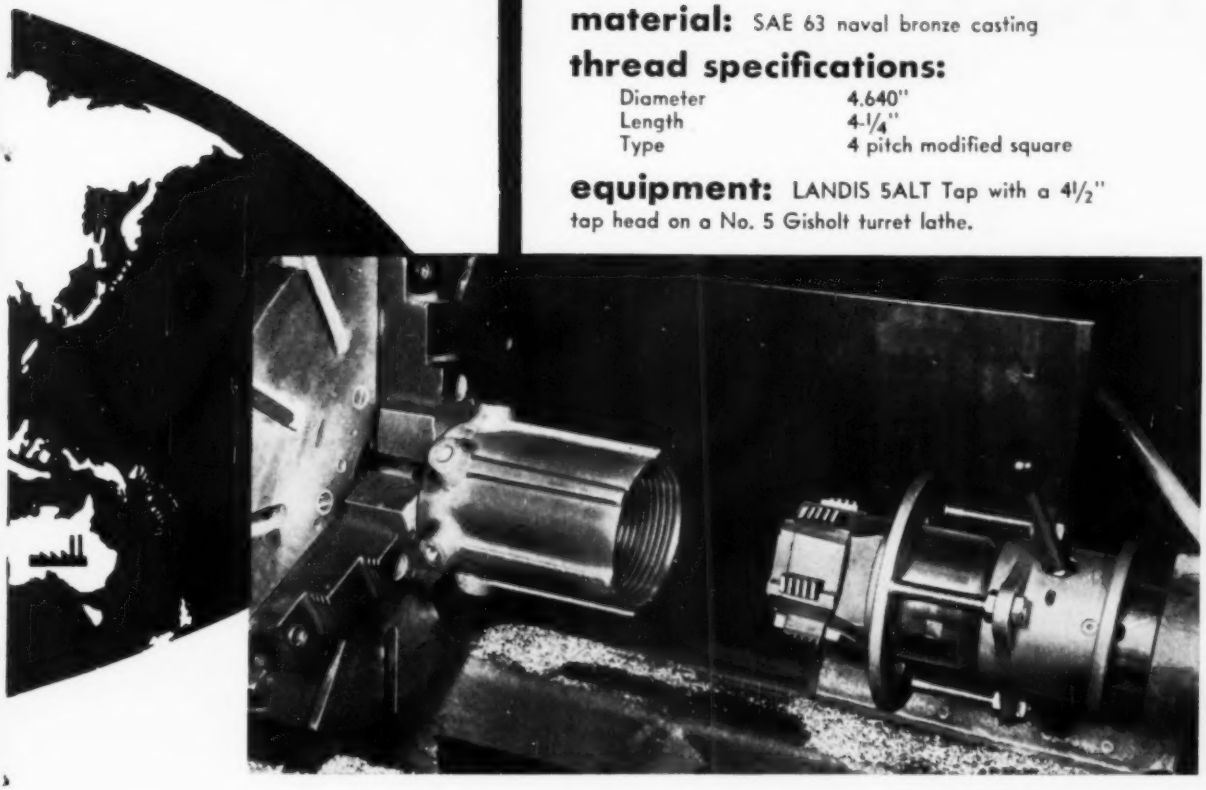
544C

material: SAE 63 naval bronze casting

thread specifications:

Diameter	4.640"
Length	4-1/4"
Type	4 pitch modified square

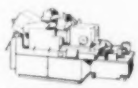
equipment: LANDIS 5ALT Tap with a 4½" tap head on a No. 5 Gisholt turret lathe.



Threading Machines

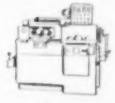
Die Heads — Rotary & Stationary

Taps — Collapsible & Solid Adjustable



Centerless Thread Grinding Machines

Thread Rolling Tools



Thread Rolling Machines

This installation is but one example of the hundreds of plants that are receiving the time-saving (money-saving!) benefits of the various types of Landis Threading Equipment.

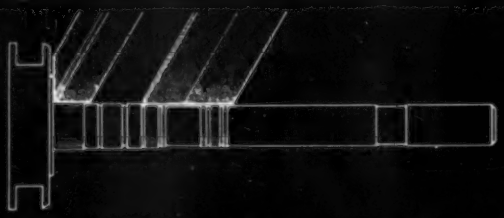
Over fifty years of development and manufacturing experience by the Landis Machine Company, a corporation devoted to the exclusive manufacture of threading equipment, is behind every Landis threading machine or tool you use. Take advantage of our technical and practical experience in Thread Cutting, Rolling, Tapping, and Grinding. We offer any help needed to ensure you of a successful Threading Operation.

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

new Landis R plunge automatic production grinder



New Landis R Plunge Grinder automatically grinding 3 diameters and face of 100 transmission shafts per hour with dependable accuracy.

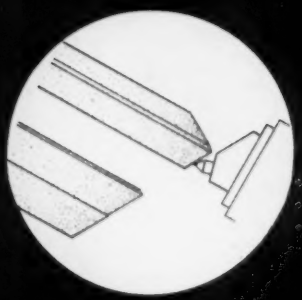
grinder

for consistent "tenths" tolerances

...completely new concept in production grinder design now gives you these new features for lower production costs

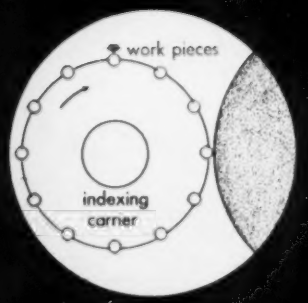
Landis MICROFEED—a new feed, symbolized by this mark, that guarantees "tenths" tolerances on a production basis

- automatically compensates for wheel wear and machine temperature variations
- eliminates costly rejects and reworking
- easy-to-set feed reduces set-up time



TRUFORM—a new dresser for accurate duplication of the profile to the wheel

- mounted on pre-loaded steel balls, to keep friction to a minimum for easy movement and accurate dressing
- dresses profiled wheels with angles up to 60°
- pushbutton control assures uniform dressing cycles



NEW Landis design assures stability and convenient maintenance

- new design box bed allows use of high production indexing rotary loader
- coolant, oil and valves outside bed
- automatic lubrication
- meets J.I.C. electrical and hydraulic standards
- automatic lateral location of work

LANDIS

precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

Symbols of Service

to all metal-working industries

The Morse "house emblem" and the NIDA seal are *double warranty* of the best you can get in quality and service.

For Morse-Franchised Distributors are like the tools they sell . . . tested and proven on their jobs . . . men of experience and responsibility who know how to get you top value for every dollar you spend on cutting tools.

So call him in today . . . *your* Morse-Franchised Distributor. You'll find him more and more of a business asset, the longer you do business with him.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS

WAREHOUSES IN NEW YORK, CHICAGO, DETROIT, DALLAS, SAN FRANCISCO

A Division of VAN NORMAN INDUSTRIES, INC.

Morse

INDUSTRIAL DISTRIBUTORS

SERVING INDUSTRY ECONOMICALLY

THE RIGHT HAND OF PRODUCTION

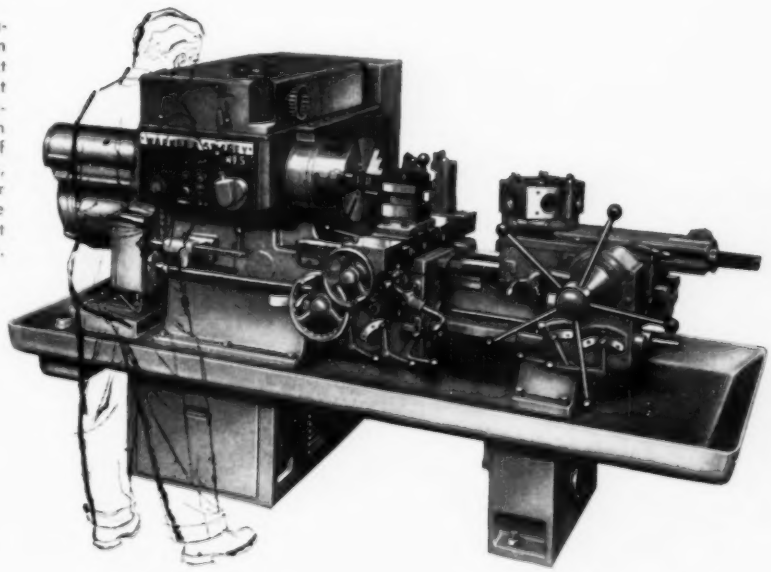
ARNER & SWASEY
1A

Warner & Swasey's exclusive Preselector provides easier and faster speed changing

- ***CALIBRATED: WORK DIAMETER—RPM-SFM***
- ***SELECT IN ADVANCE—CHANGE AT A TOUCH***

Ease-of-operation is built into all Warner & Swasey equipment because our design engineers know maximum production can be obtained only when operators like their machines. As an example: Our patented Preselector permits easy set-up of the next cutting speed while a cut is still being taken, saving valuable production time within the work cycle. Operators like the Preselector's rapid touch-control of our hydraulic headstock. Because it's quicker and easier to change speeds in Warner & Swasey's effectively-designed headstocks, machining is far more efficient, requires less tiring effort. Speed Preselectors are available on all Warner & Swasey Saddle Type Turret Lathes as well as on No. 4 and No. 5 Ram Type Machines. Yes, your operators can handle work faster, better and more economically on Warner & Swaseys.
Our local Field Representative has all the facts.
Why not call him, today?

Surface speeds for various work diameters at each RPM setting are shown on a large direct-reading chart. Correct speeds are chosen for each cut without requiring separate surface speed calculations, then marked in sequence with numbered clips placed along the top of the chart drum. By following his clips, operator preselects the correct speed for each cut with a glance-and-a-twist of the knob—and when he's ready, gets that speed with just a touch on the handle.



WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

From the Report — A Typical Cylindrical Job

Page 6 On a crush-truing job in Indiana, a 20 x 2 x 12" wheel was used . . . for grinding . . . a machine spindle. The material was about Rockwell C48 . . . when a wheel of 32A120-N9VG (32 ALUNDUM — G bond) was put on the job, the operator reported he could get 4 times as many pieces per dressing before the wheel face began to lose its shape, and yet there was no trace of burn.

Hot off the press!

From Norton to you

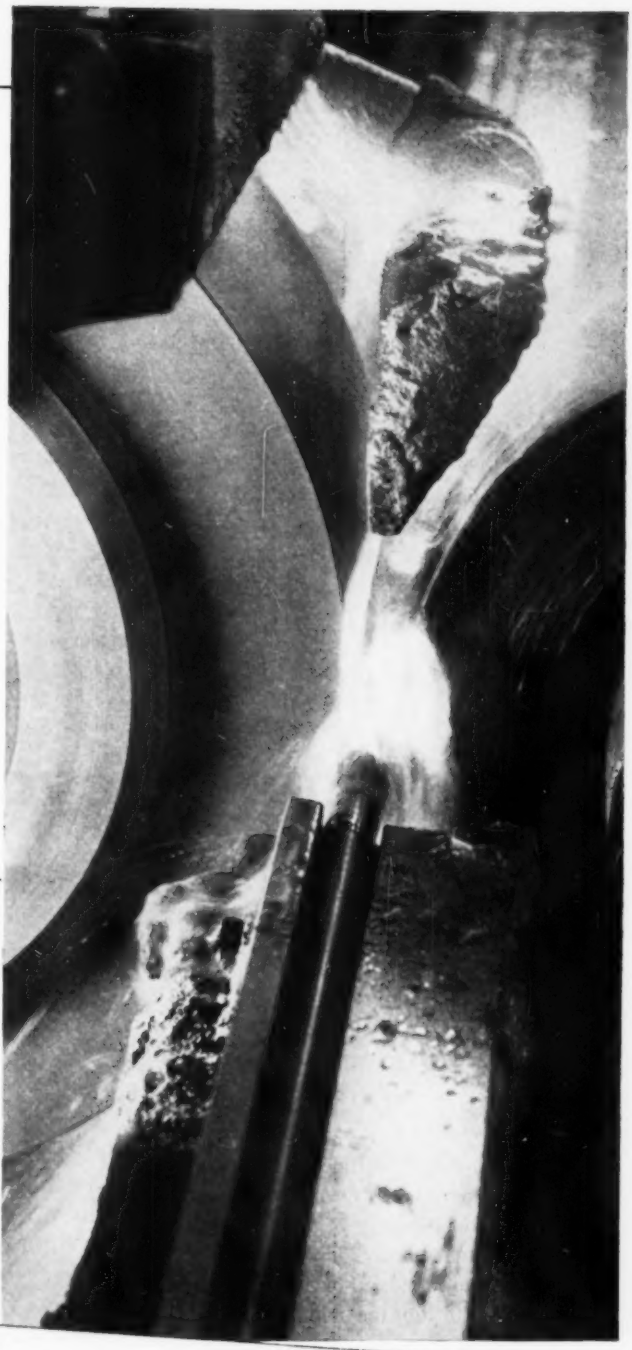
Join the nation-wide progress now being made in every type of O.D. grinding! The new Norton publication, *A Report on O.D. Grinding*, tells you how.

Based on extensive service by helpful Norton Men, this Report brings you many valuable new solutions to O.D. problems . . . describes "tricks of the trade" that get the most out of cylindrical and centerless machines . . . provides on-the-job performance of different grinding wheels in different applications . . . and analyzes the following highly efficient abrasives and bonds.

Abrasives. 44 ALUNDUM* (aluminum oxide) abrasive, an ideal cost-cutter for many O.D. jobs. 32 ALUNDUM abrasive, top-quality for grinding various materials, including harder steels. The other time-tested Norton ALUNDUM abrasives are also included. And 37 and 39 CRYSTOLON* (silicon carbide) abrasives are best-suited for grinding cast-iron, non-ferrous metals, carbides and other materials.

Bonds. G bond, biggest advancement in vitrified bonds, gives best results in most O.D. jobs, particularly crush-truing. Vitrified BE bond is

An Up-To-The-Minute Report *filled with* Inside Facts on Outside Grinding



another widely-used favorite. Where CRYSTOLON abrasive is required, K bond is outstanding. B11 resinoid bond excels in uniformity with both ALUNDUM and CRYSTOLON wheels. For centerless feed wheels, R51 rubber bond assures complete regulating control without slippage.

Your Norton Man will be glad to work with you in determining just what improvements in grinding methods and wheel selection will assure you the lowest cost-per-piece produced. More news about how this expert can bring the value-adding, profit-boosting "Touch of Gold" to your production is stated in the Report. Your copy of this Report is available from your local Norton Representative . . . and is as near as your phone. Call for it today. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world

From the Report — A Typical Centerless Job

Page 6-7. On a centerless operation involving heavy stock removal from 2" diameter bars 4' long, 44A54-MVBE (44 ALUNDUM — BE bond) has been reported to be the best wheel specification they have ever used. It cuts faster, cooler and requires less truing than any other vitrified wheel . . . is priced much lower than resinoid or rubber bonded wheels.

NORTON ABRASIVES

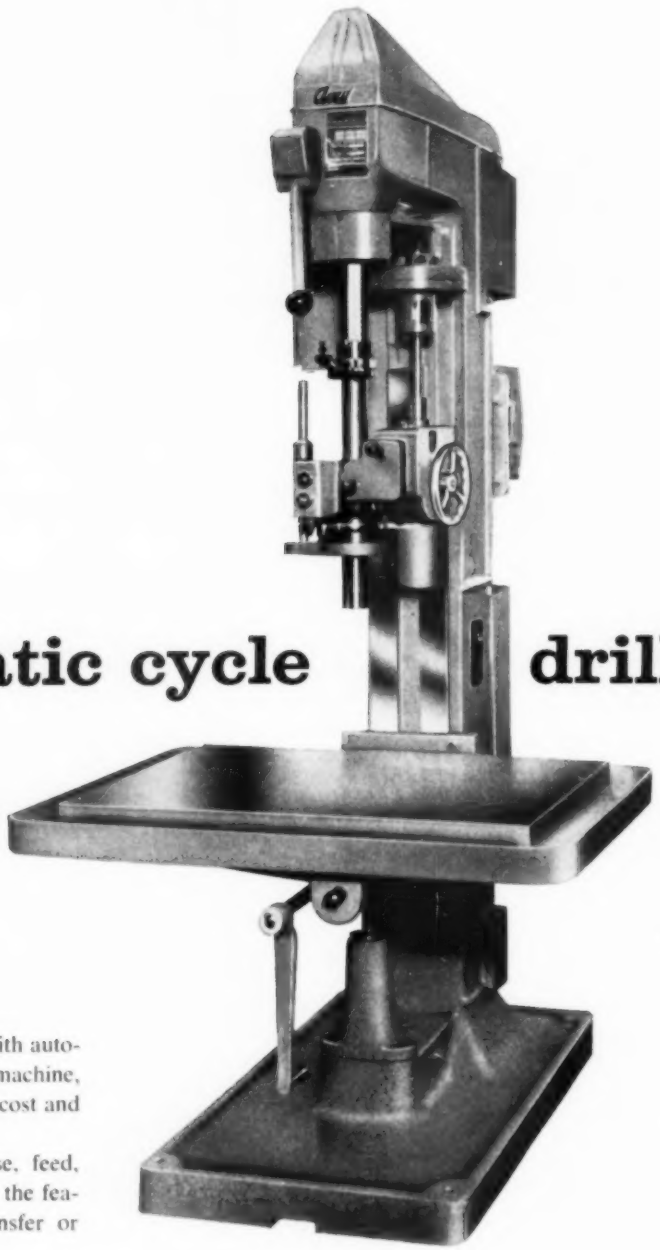
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

W-1900

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

automatic cycle drilling



■ You can chop your time costs with automatic set-ups on this new Avey machine, and still take advantage of the low cost and flexibility of a standard unit.

Adjustable rapid power traverse, feed, and rapid return of the spindle are the features which permit automatic transfer or rotary index fixturing.

At the same time, you get adjustable feeds, speeds, table travel, head travel, and Avey's advanced spindle construction.

The machine is available with No. 2, 3, and 4 Morse Taper; 1 to 3 HP motors; single or multiple spindles. Your request for additional information will be promptly answered. Avey Division, The Motch & Merryweather Machinery Co., P. O. Box 1264, Cincinnati 1, Ohio.

■ For help in cutting the cost of your drilling operations, call one of these competent distributors near you:
Asheville: Tidewater Supply Co.
Atlanta: R. O. Deaderick Co.
Birmingham: McVoy-Hausman Co.
Boston: Rudel Machinery Co., Inc.
Buffalo: Rudel Machinery Co., C. H. Briggs Division
Charlotte: Tidewater Supply Co.
Chattanooga: R. O. Deaderick Co.
Chicago: Marshall & Huschart Machinery Co.
Cincinnati: Motch & Merryweather Machinery Co.
Cleveland: Motch & Merryweather Machinery Co.
Columbia: Tidewater Supply Co.
Dallas: Briggs-Weaver Machinery Co.
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Detroit: Motch & Merryweather Machinery Co.
Ft. Lauderdale: Southeast Machinery Co.
Houston: Oliver H. Van Horn Co., Inc.
Indianapolis: State Machinery Co.
Kansas City: Blackman & Nuetzel Machinery Co.

another first by Avey

Knoxville: R. O. Deaderick Co.
Los Angeles: Tornquist Machinery Co.
Milwaukee: Marshall & Huschart Machinery Co.
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Portland: Halladie Machinery Co.
Roanoke: Tidewater Supply Co.
Rochester: Rudel Machinery Co., C. H. Briggs Division
Rockford: Marshall & Huschart Machinery Co.
Rock Island: Marshall & Huschart Machinery Co.
San Francisco: Harron, Rickard & McCone Co.
Seattle: Halladie Machinery Co.
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South Bend: Marshall & Huschart Machinery Co.
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Syracuse: Rudel Machinery Co., C. H. Briggs Division
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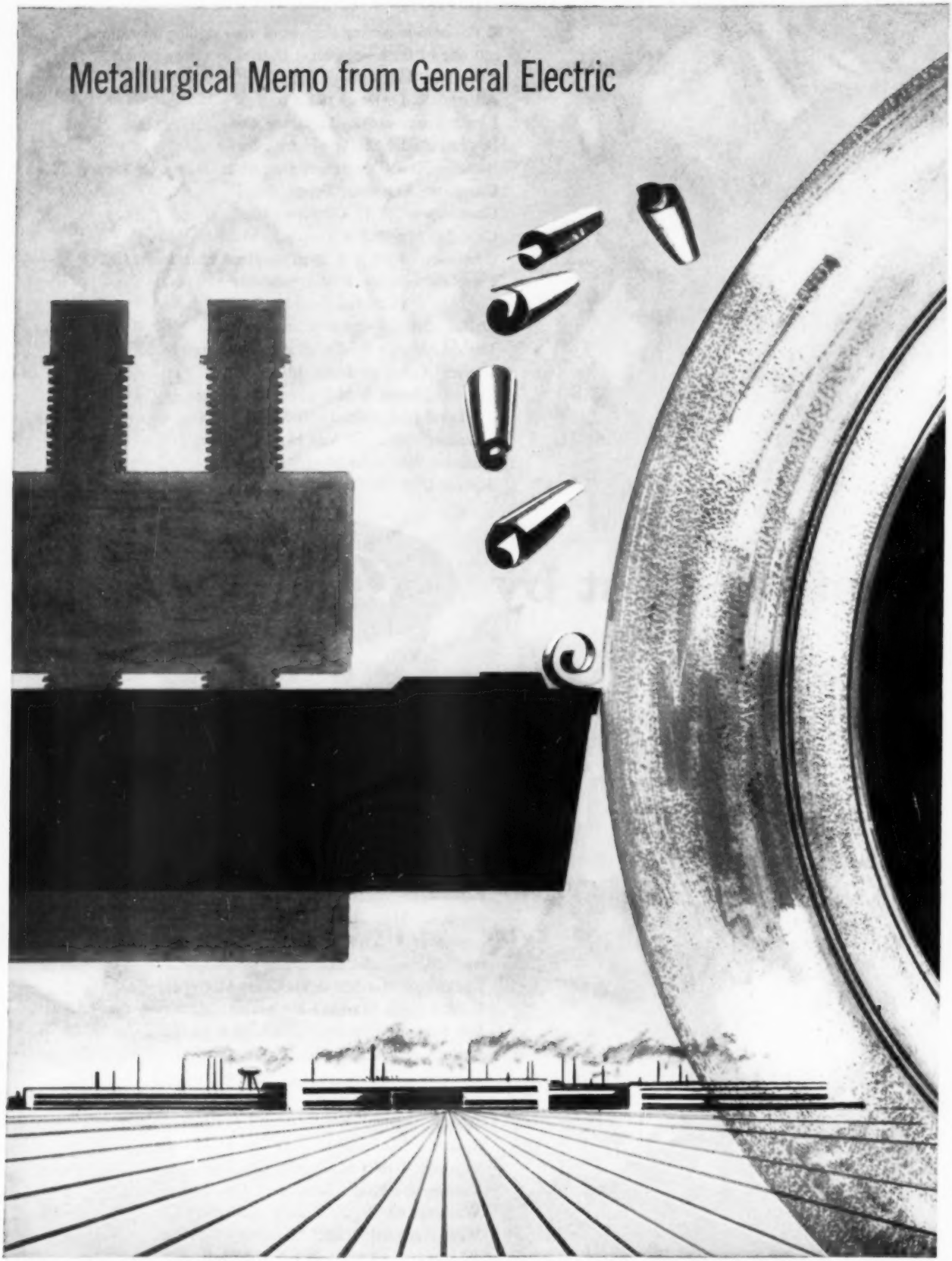
West Hartford: Rudel Machinery Co., Inc.
Windsor: Rudel Machinery Co., Ltd.

CIRCLE 187 READER SERVICE CARD


Metallurgical Memo from General Electric

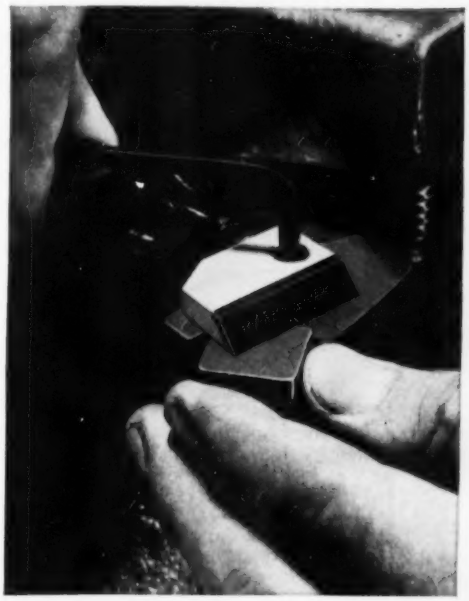
Why 242 different toolholders?

Metallurgical Products Department reports
on an expanded new line of Lift-O-Matic toolholders
. . . 242 sizes to speed changeovers on every job

Nobody needs to tell you what carbides have done for metalcutting . . . or how Carboloy® disposable inserts have led the way. *But making inserts is only half the job;* the other half is to provide you with toolholders that let you get full value from these miracle metals.

Carboloy Lift-O-Matic toolholders do this job. There are now three types—positive rake, negative rake, and tracer. All provide access to the clamp setscrew from either top or bottom—all provide for fastest possible indexing or changeover—all cut your inventory needs by providing interchangeability of parts. In addition, Carboloy *heavy duty* toolholders are made for cutting conditions where a maximum strength holder is demanded.

This expanded Lift-O-Matic toolholder line is stocked by your *local* Authorized Carboloy Distributor—3 types, 9 styles, 242 sizes—*plus* the widest range of styles, sizes, and grades of *inserts* in the industry. Call him (see the Yellow Pages under "Carbides"); or write: *Metallurgical Products Department of General Electric Company, 11149 East 8 Mile Street, Detroit 32, Michigan.*



New! Self-raising chipbreaker clamp. A twist of the wrist releases insert for indexing . . . automatically lifts and lowers chipbreaker. No more prying chipbreaker free. No more fumbling with loose chipbreaker. You choose from three chipbreaker widths for more accurate chip control.

CARBOLOY®
CEMENTED CARBIDES

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS
MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

Allison-Campbell

ABRASIVE CUTTING KNOW-HOW

ACCO for Better Values

Oscillation Improves Abrasive Cutting 4 Ways

On an oscillating-type abrasive cut-off machine, the cutting wheel is rocked back and forth *across* the cut while the wheel is fed downward. This horizontal movement produces some remarkable results.

1 **Greater cutting capacity** is one big advantage of oscillation. Because oscillation reduces the arc of contact between the wheel and the work, it is possible to cut solid steel bars up to 12″ square. Without oscillation, 2″ to 3″ would be the practicable limit.

2 **Faster cutting** is another benefit of oscillation. Because the reduced arc of contact offers less resistance to the cutting wheel on large sections, the same wheel cuts faster, straighter, and with less feed pressure. Cutting rates of 4 to 8 seconds per square inch are maintained on even the largest cross-sections.

3 **Better quality cuts** are obtained with oscillation. Less heat is generated because of the small arc of contact, and the rocking action permits coolant to enter the cut more easily and prevent any heat build-up.

Burn-free cuts are produced with negligible burr, and there is little or no need for further finishing.

4 **Longer wheel life** is an important economy factor. The lower cutting temperature resulting from oscillation adds extra cuts to the life of every wheel.

The better flow of coolant within the cut washes away metal chips and loose abrasive, helping wheel efficiency.

HOW ALLISON-CAMPBELL CAN HELP

A complete selection of machines and wheels for *any* cut-off application is offered by ALLISON-CAMPBELL. Four types of CAMPBELL machines—chop stroke, oscillating, horizontal, and rotary—in capacities from the smallest stock to 14″ rounds . . . billets up to 12″ square . . . plate up to 6″ thick and 20 ft. long. ALLISON wheels—more than 150 different specifications—rubber or resinoid bond—3″ to 34″ diameters—.006″ to 3/16″ thick.

Expert recommendations from your ALLISON-CAMPBELL Field Engineer can solve your cut-off problems for you. He'll be glad to show you how to get the faster, cleaner cuts you can expect from modern abrasive cutting techniques. Ask him.

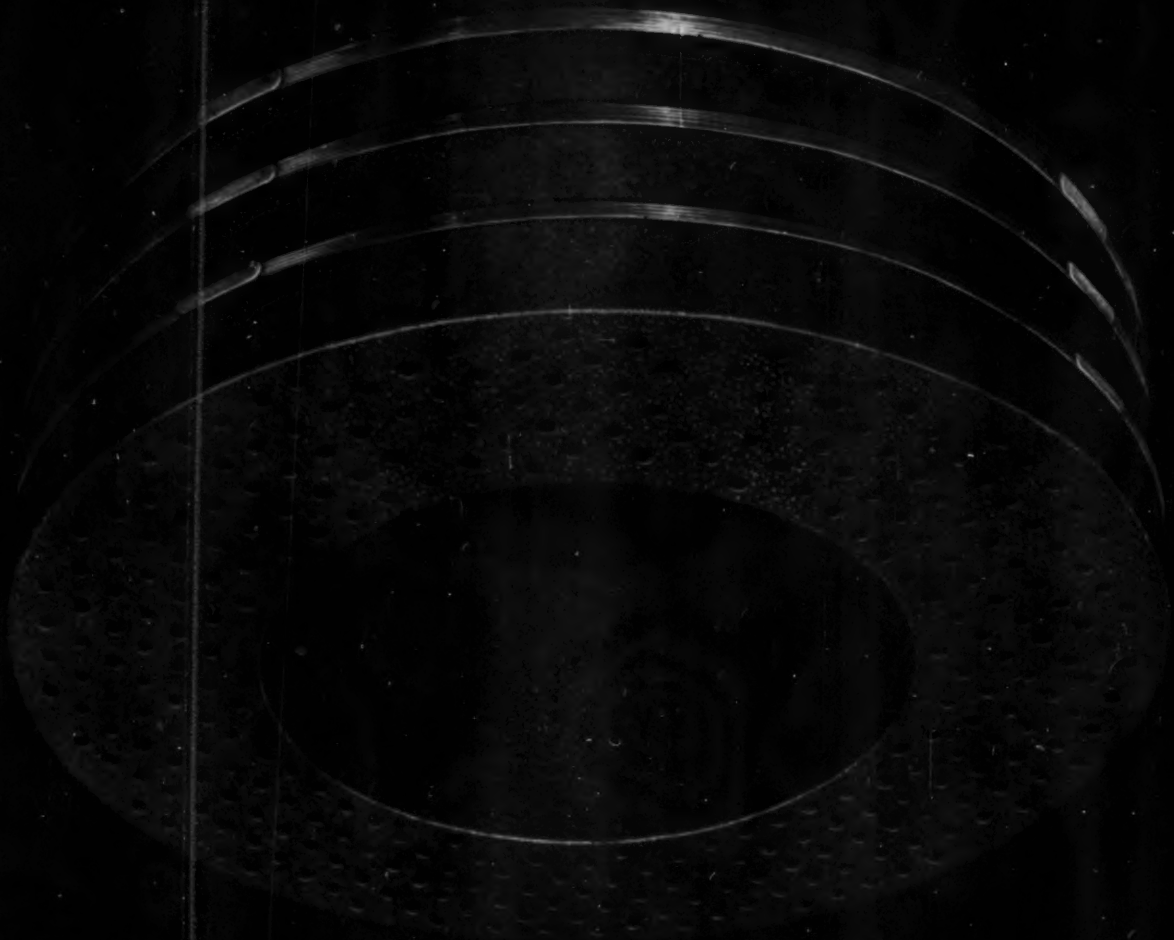
WRITE FOR NEW BULLETIN

• Individual analysis of your cutting problems can be made in the new ALLISON-CAMPBELL Demonstration Laboratory. Write for a copy of DH-20, a new bulletin which describes how you can use these facilities. Complete details on ALLISON wheels and CAMPBELL machines are also available.

ALLISON-CAMPBELL DIVISION
AMERICAN CHAIN & CABLE

923 Connecticut Avenue, Bridgeport 2, Conn.

ACCO



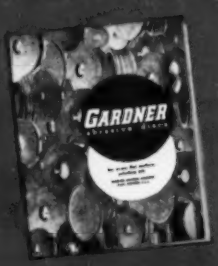
Gardner cylinder wheel with new BKGR bond increases production from 70,000 parts to 127,000

actual competitive test gives user "best wheel life ever"

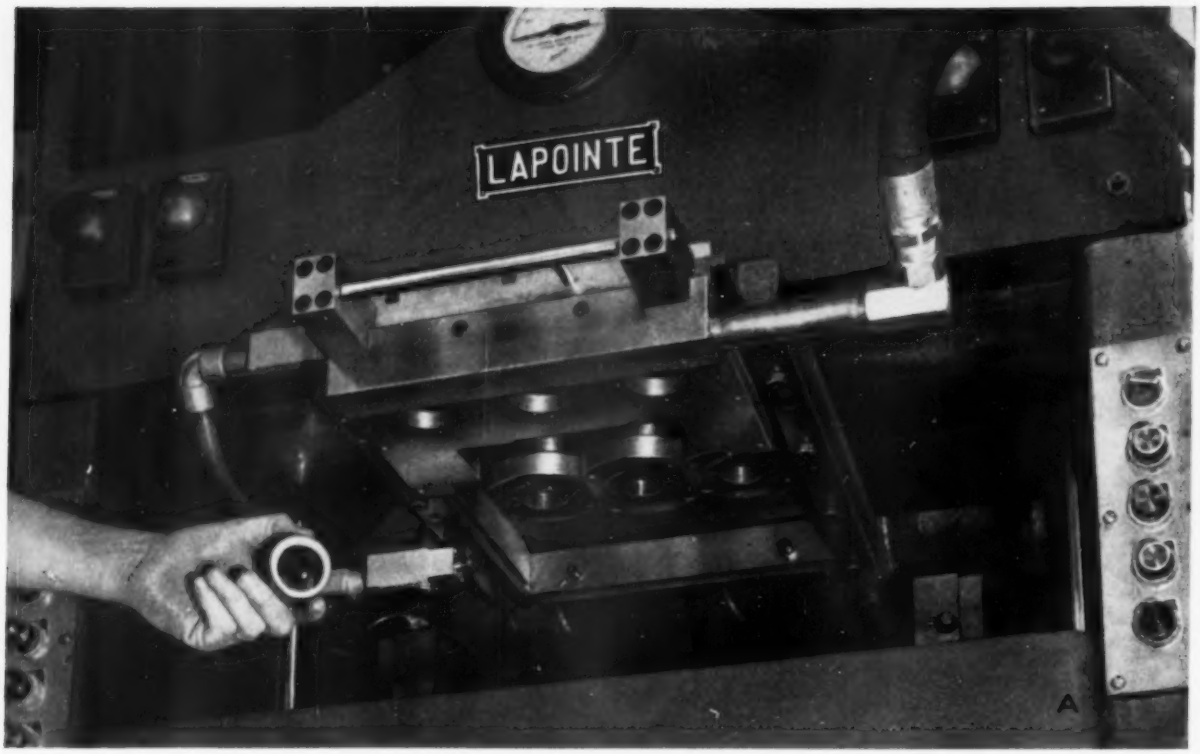
production facts

Part:.....Exhaust flanges
Machine:
Vertical Spindle Surface Grinder
Abrasive:.....18" x 5" x 10"
Production:
127,000 parts per wheel
Dressing Time:
Only two dressings during entire life

Investigate the profit possibilities of Gardner grinding for your production. Call your Gardner Abrasives Specialist, or write for Abrasive Catalog AC-57.



GARDNER
abrasive discs
BELOIT, WISCONSIN



Are you making any of these:

• bushings? • piston pins? • shock absorber tubes? • cylinders? • gear blanks?

and similar production parts

On that class of long-run work,

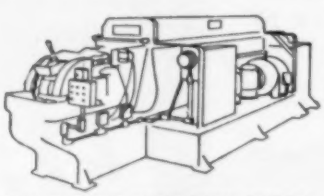
this **LAPOINTE** VPU VERTICAL PULL-UP

BROACHING MACHINE

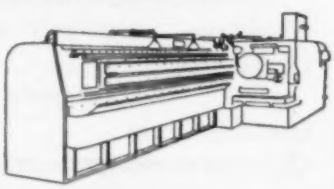
will out-produce any other type of machine!

Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.

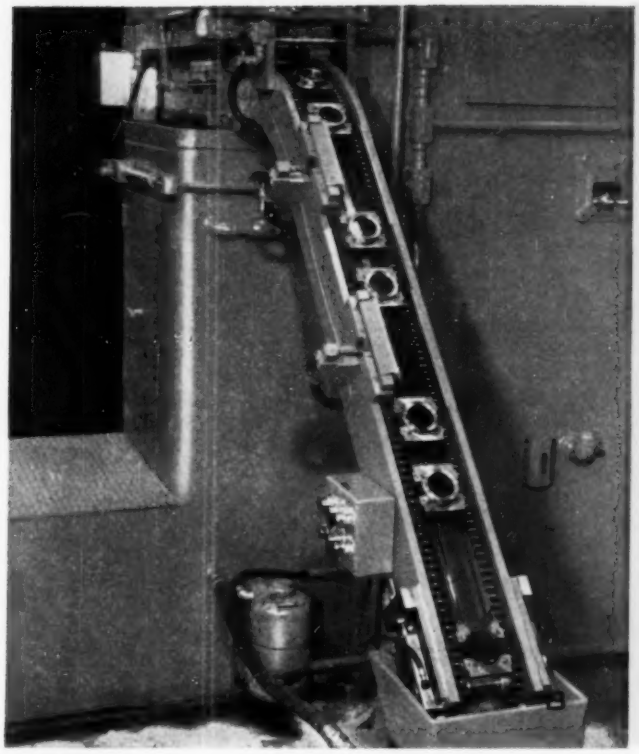
60" STROKE HORIZONTAL, ELECTRIC

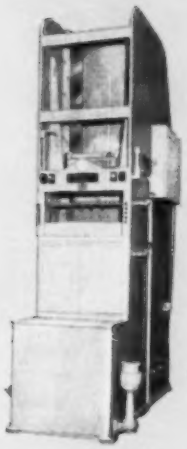


CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC





A Close-up view of loading mechanism, and the hydraulic steering pump insert being broached at 400 per hour.

B This picture shows another automotive part, handled by the loading chute which can be adapted to the Lapointe Vertical Pull-Up Broaching Machine.

C Using a full length follower, broaches are guided the full length of the broaching stroke on this Lapointe VU-6 Vertical Pull-Up Broaching Machine.

When you convert to Lapointe-Broaching with the VPU machine, you achieve astounding savings in the *mass-production of precision parts.* You get repetitive accuracy to extremely close tolerances . . . you get broached surfaces of amazingly fine finish free from chatter marks . . . you get *no scrap parts.*

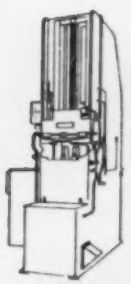
Built-in rigidity contributes greatly to the accuracy and fine finish obtainable on all Lapointe Vertical Pull-Up Broaching Machines. A good example of this type of machine is shown here, the Lapointe model VU-6 with 25-ton capacity, 60-inch stroke. It is broaching a hydraulic steering pump insert at the production rate of *400 pieces per hour!*

Other Lapointe Vertical Pull-Up Broaching Machines in this series are available from 10- to 25-ton capacity, 36- to 60-inch stroke. They are fully described in our **new Bulletin VPU.** Write for it.

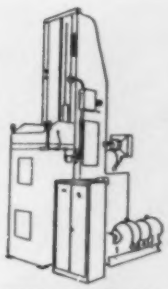
THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

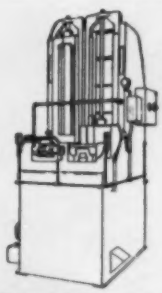
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



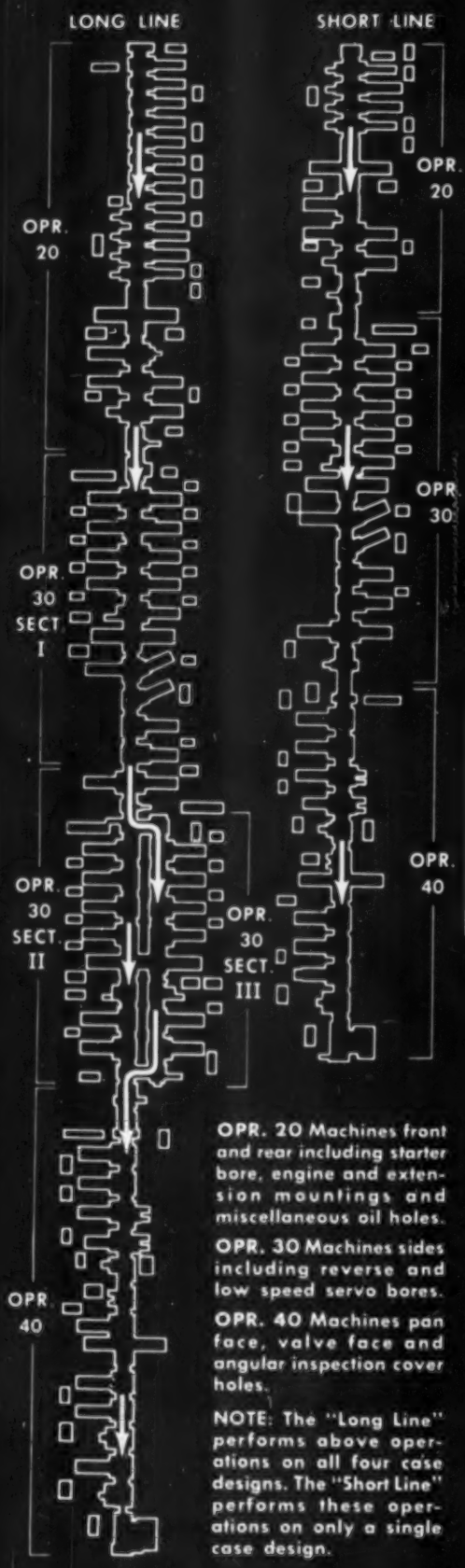
DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING

Complete Product Mix Processed On New Cross Transfer-matics



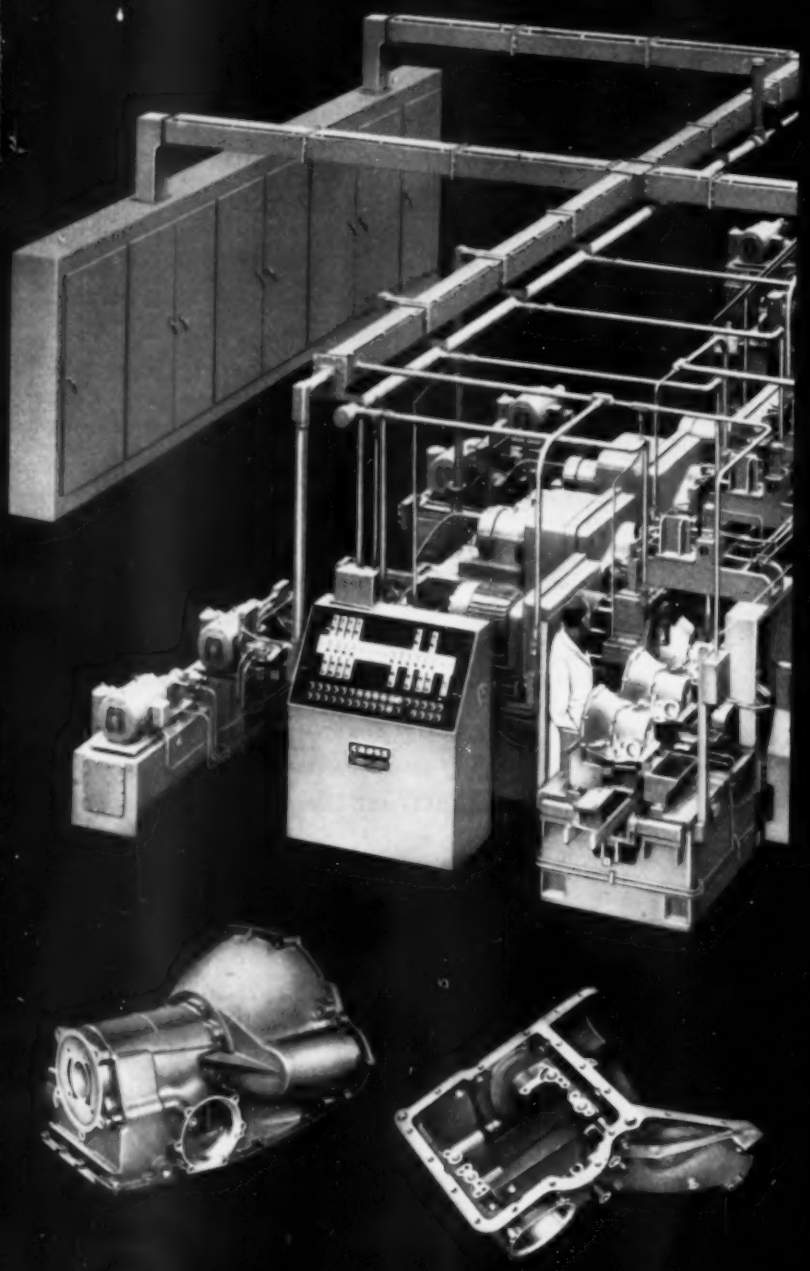
OPR. 20 Machines front and rear including starter bore, engine and extension mountings and miscellaneous oil holes.

OPR. 30 Machines sides including reverse and low speed servo bores.

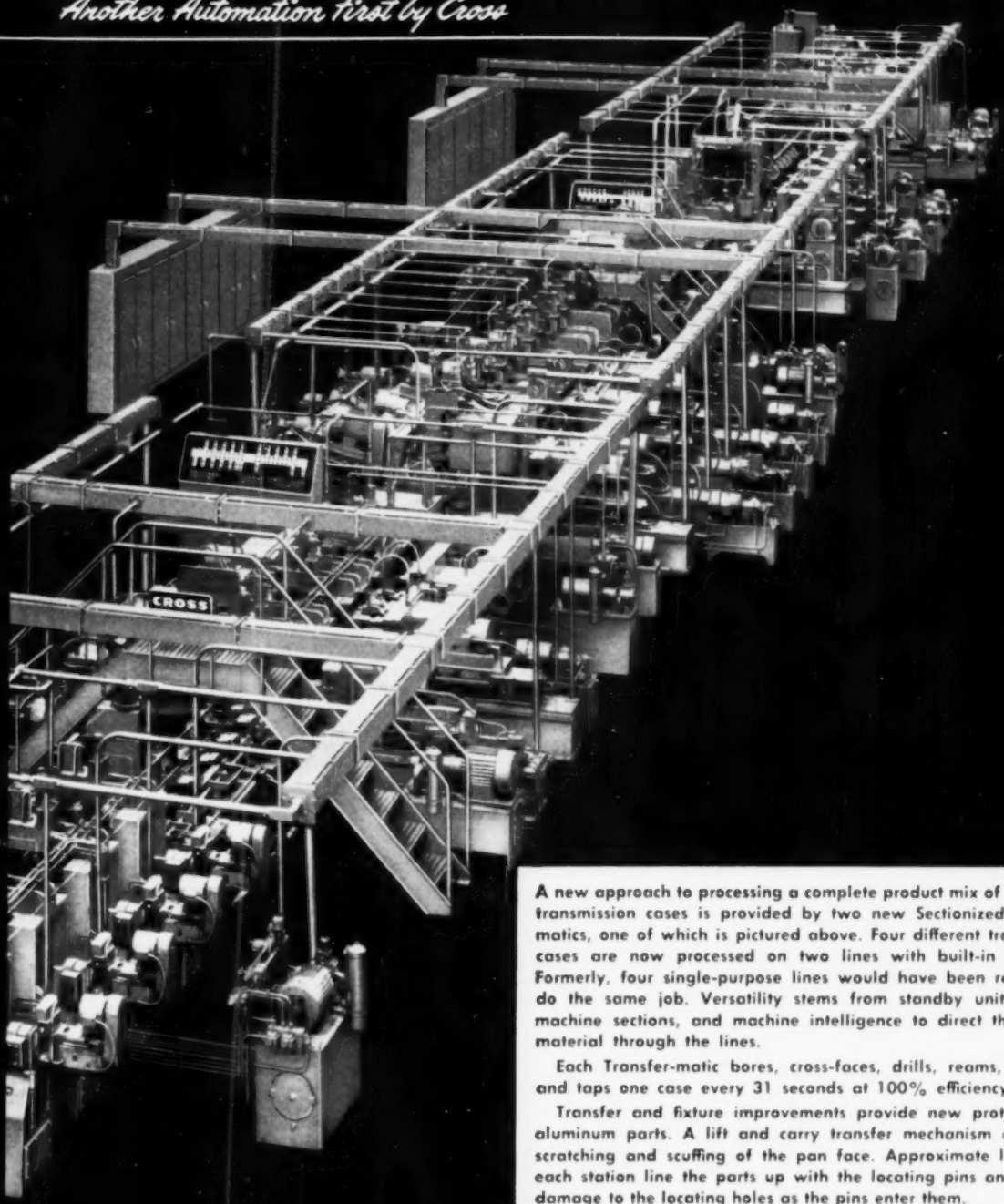
OPR. 40 Machines pan face, valve face and angular inspection cover holes.

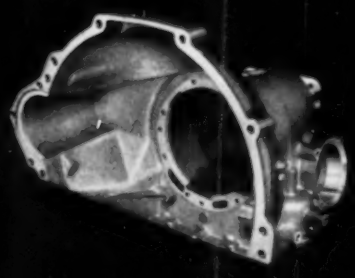
NOTE: The "Long Line" performs above operations on all four case designs. The "Short Line" performs these operations on only a single case design.

Floor Plan Layout of Two New Cross Sectionized Transfer-matics



Another Automation First by Cross





A new approach to processing a complete product mix of aluminum transmission cases is provided by two new Sectionized Transfer-matics, one of which is pictured above. Four different transmission cases are now processed on two lines with built-in flexibility. Formerly, four single-purpose lines would have been required to do the same job. Versatility stems from standby units, off-line machine sections, and machine intelligence to direct the flow of material through the lines.

Each Transfer-matic bores, cross-faces, drills, reams, chamfers and taps one case every 31 seconds at 100% efficiency.

Transfer and fixture improvements provide new protection for aluminum parts. A lift and carry transfer mechanism eliminates scratching and scuffing of the pan face. Approximate locators in each station line the parts up with the locating pins and prevent damage to the locating holes as the pins enter them.

Down time is minimized by use of "static" controls since conventional relay maintenance is virtually eliminated. Programmed tool changes with Cross Toolometers and Machine Control Units and a machine communications network facilitate "combined" tool and machine maintenance.

Sectionized machine design insures peak output by feeding parts into the machine behind "down sections."

The Cross "building block" principle and optimum standardization assure highest flexibility for part design changes or re-application of machine units for entirely new part processing.

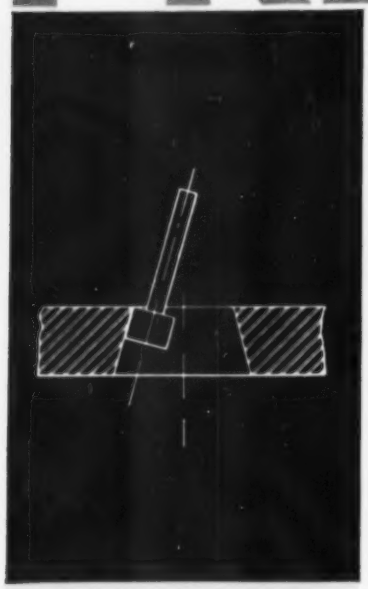
Established 1898

THE **CROSS** CO.

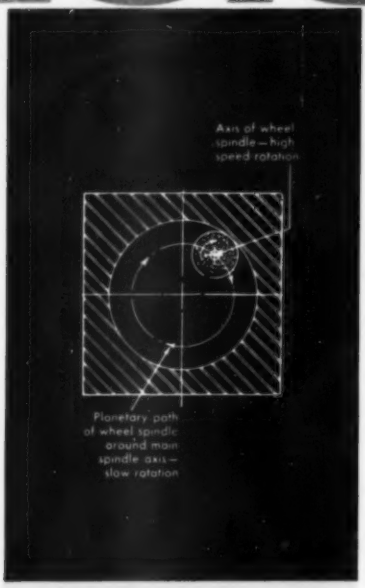
First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

PRECISION



TAPER
(and straight)



PLANETARY

OUTFEED wheel to grind hole. INFEED to grind O. D. of post
Axis of wheel spindle—high speed rotation
Planetary path of wheel spindle around main spindle axis—slow hand rotation

CONTOUR
(with head)

MOORE-FOSDICK JIG GRINDER

A new degree of speed, convenience and capacity is brought to precision grinding in the Moore-Fosdick Jig Grinders. This combination of the unique Moore Grinding Head with Fosdick Jig Borer Tables makes possible advantages never before available.

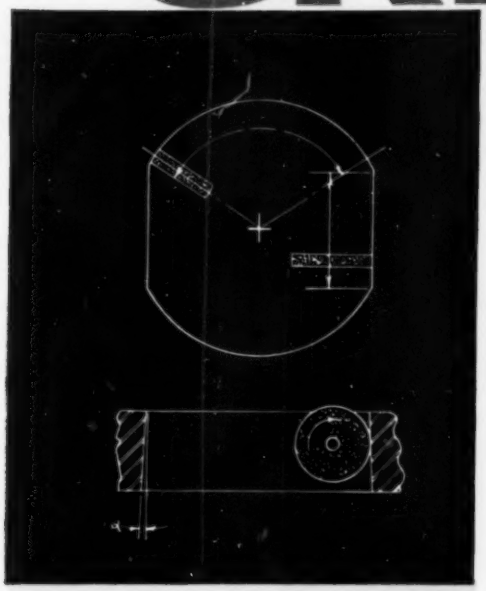
All standard jig grinding operations can speedily and conveniently be accomplished on the Moore-Fosdick, in addition to many which were formerly known as "trick" operations. Both straight and tapered holes can be located and ground, as well as contours consisting of radii and tangents or chordal surfaces.

The angular and indexing device built into the main spindle and the slot grinding attachment permit quick, accurate grinding of any contour, regular or irregular. Setting work on a rotary table is unnecessary except for angular surfaces. Chop grinding removes stock rapidly and makes contour grinding even faster.

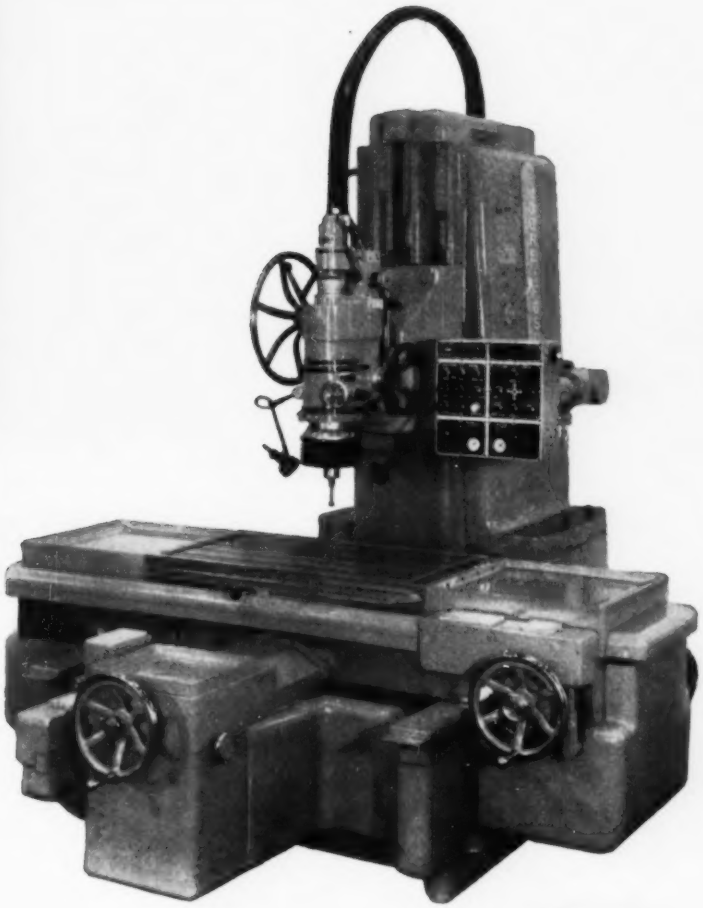
An infinite range of grinding speeds—from 12,000 to 60,000 rpm—allows accurate control

GRINDING

OF LARGE WORK



CONTOUR
(with slot grinder)



of grinding and stock removal. Long-lasting precision is assured by quality construction and by many features that provide dimensional stability, including spindle-housing heat control.

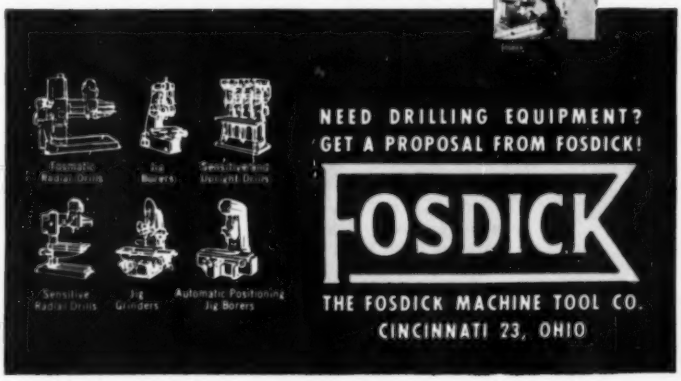
The machine may be ordered in any one of three models, one of which comes in two sizes. *All will give accuracy of ± .0001".*

Measuring is accomplished with measuring rods and inside micrometers or with Direct Dimension Measuring, where dimensions are simply set from blueprint to direct reading drum dials. Automatic positioning is also available.

Numerical control by punched tape or cards is available.

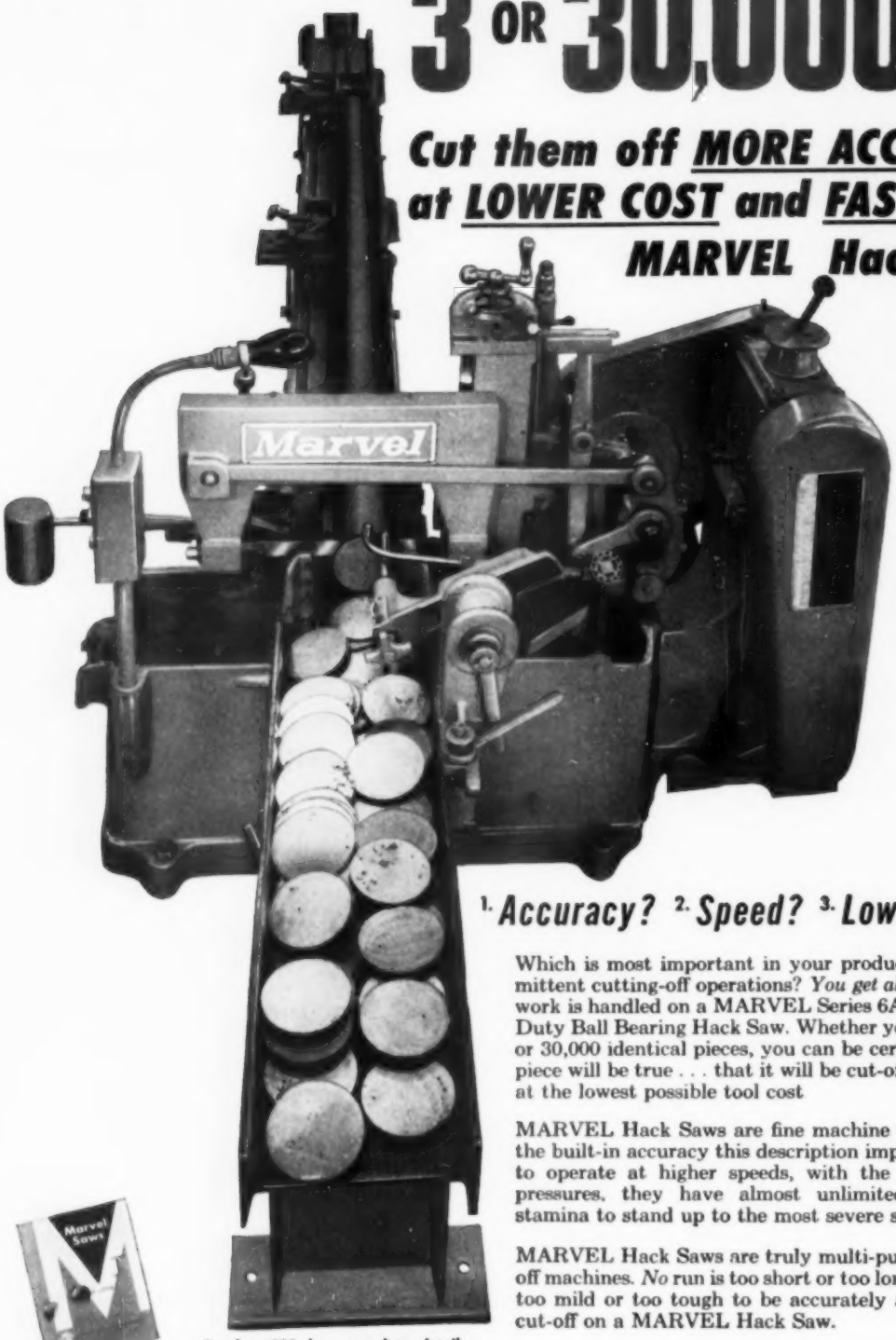
For a complete description of the various grinding operations, measuring systems and other machine features—many exclusive with Moore-Fosdick, write today for your jig grinder catalog.

Ask for Bulletin JG-A.



3 OR 30,000 PIECES

Cut them off MORE ACCURATELY at LOWER COST and FASTER on a MARVEL Hack Saw



1. Accuracy? 2. Speed? 3. Low Cost?

Which is most important in your production or intermittent cutting-off operations? *You get all 3* when your work is handled on a MARVEL Series 6A or 9A Heavy Duty Ball Bearing Hack Saw. Whether you're cutting 3 or 30,000 identical pieces, you can be certain that each piece will be true . . . that it will be cut-off quickly, and at the lowest possible tool cost

MARVEL Hack Saws are fine machine tools, with all the built-in accuracy this description implies. Designed to operate at higher speeds, with the heaviest feed pressures, they have almost unlimited power and stamina to stand up to the most severe service.

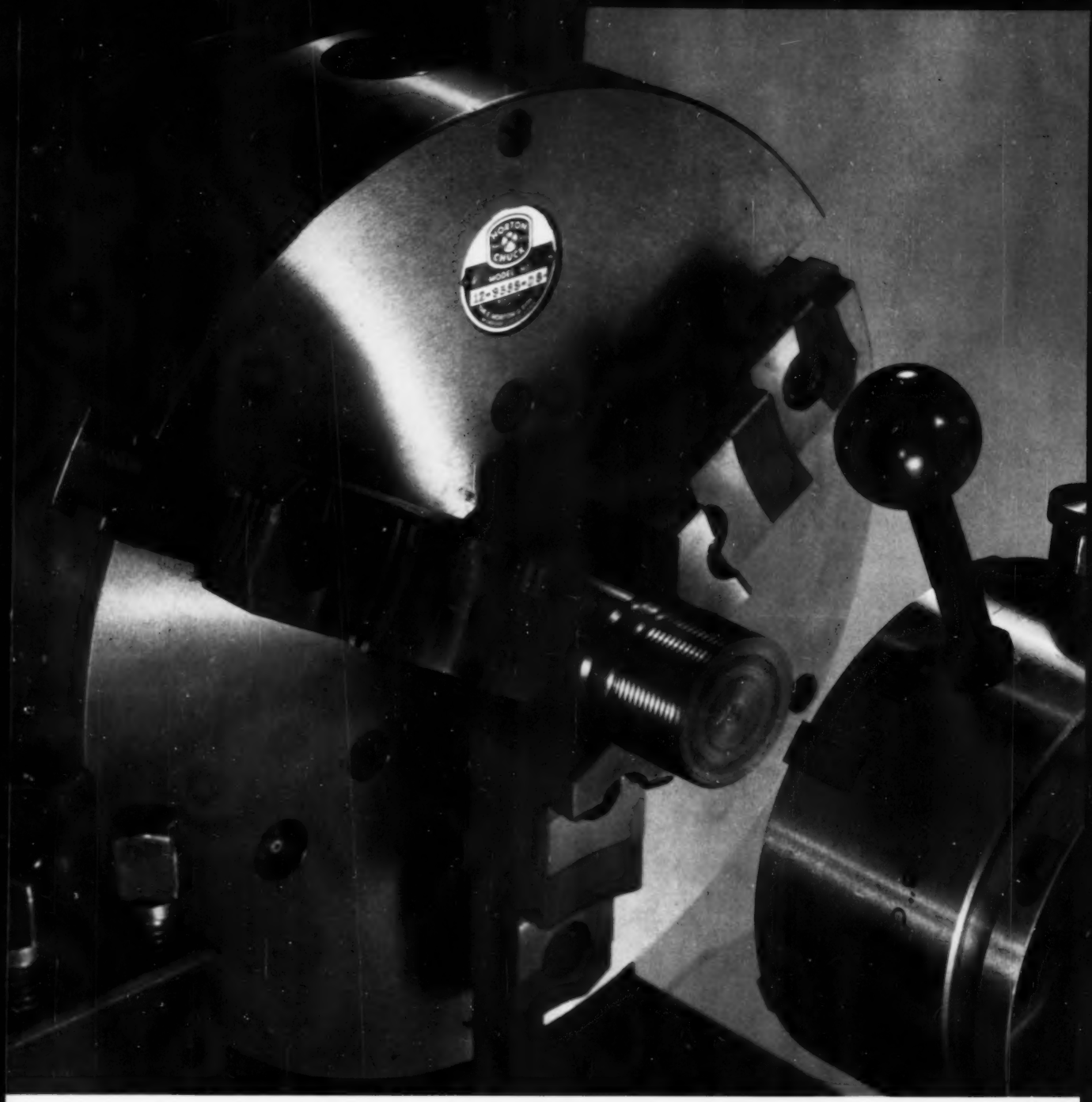
MARVEL Hack Saws are truly multi-purpose cutting-off machines. *No* run is too short or too long, *no* material too mild or too tough to be accurately and efficiently cut-off on a MARVEL Hack Saw.

Catalog C85 has complete details, facts and figures on both Marvel metal cutting Hack Saws and Band Saws. Write for it today.

S-1306

ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. • CHICAGO 39, ILLINOIS

MARVEL Metal Cutting SAWS
Better Machines–Better Blades



CLASS 3 THREADS WITH HORTON CHUCK!

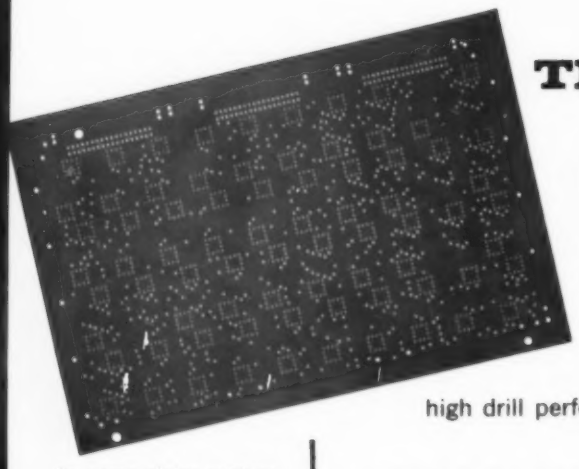
What do we mean, talking about chucks and class 3 threads in the same breath? Just this: unless the work is held concentrically and runs true, that die head which is the best there is for the job (Geometric, of course) cannot compensate for excessive "run out" in the chuck.

That's why you need precision chucks, for precision threading.

Running class three threads? Better check your chucks, "Chuck" out worn out chucks, and, replace them with new HORTONS.

INDUSTRIAL DISTRIBUTOR
SERVING INDUSTRY ECONOMICALLY
THE RIGHT HAND OF PRODUCTION

GEOMETRIC-HORTON, NEW HAVEN 15, CONNECTICUT



On some plates such as this one, up to 1014 holes are drilled on one pass!

The odds are 579 to 1

Those are the odds on each drill in this setup at Burroughs Corporation's Tireman Plant in Detroit. When a 3/32" circuitry panel of Epoxy glass, copper clad .0014" both sides, contacts these 580 "Greenfield-Ampco" drills, failure of any one drill would offset the efficiency of the other 579 on that pass. And each pass carries the same odds! So a job like this demands not only high drill performance, but highly uniform performance as well.

GREENFIELD TAP & DIE

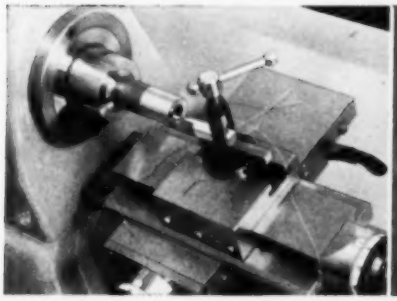
GREENFIELD, MASSACHUSETTS

BUY FROM YOUR GREENFIELD DISTRIBUTOR FOR SERVICE AND QUALITY

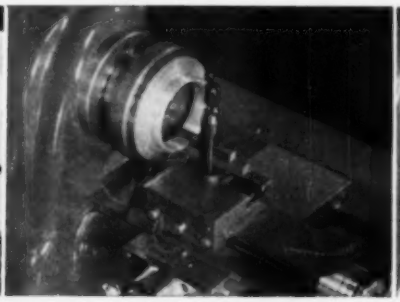
HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

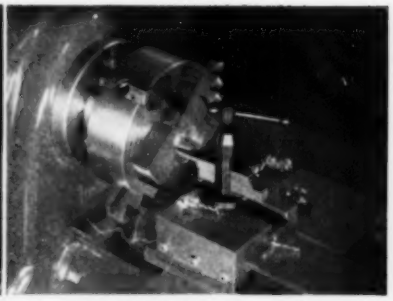
Correct Size - High Speed - Precision Results



Collet Work — The right machine for collet work of 1-1/16" or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".

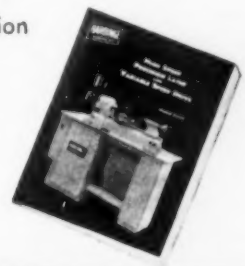


Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 3500 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease of operation assure precision results

SPECIFICATIONS:
1 1/16" Collet Capacity
9" Swing
17" Center Distance
Infinitely Variable Speed
230—3500 r.p.m.



OFFICES IN PRINCIPAL CITIES
Export Office: 269 Lafayette St., New York 12, N. Y.

Send for Free illustrated Bulletin DV 59

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

ADAMAS 548 CHALLENGES
YOUR PRESENT STEEL CUTTING GRADE!

A unique balance of key metallurgical properties . . . this is the difference between Adamas 548 and other steel cutting carbide grades. Let 548's metallurgical superiority prove itself on your next steel cutting job. Take your first step toward optimum carbide performance *today* . . .

(Specific Grade 548 physicals relating to hardness, density, and transverse rupture strength plus microphoto of grain structure available upon request.)

SELECT a throwaway style and size from the form below. Complete the form and request your Purchasing Department to mail it to Adamas. No invoice will be sent to you for 30 days. During this 30 day period . . .

TEST the package of ten Grade 548 inserts you receive against your present steel cutting grade.

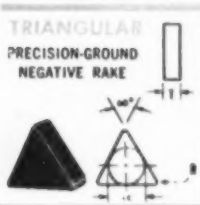
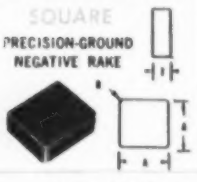
JUDGE for yourself the performance of your 548 inserts. If for any reason you feel 548 did not outperform your present steel cutting grade, simply return all used and unused inserts and your order will be automatically cancelled . . . at no charge to you!

SEND FOR YOUR 548 PACKAGE TODAY!

CUT OUT AND MAIL

ADAMAS CARBIDE CORPORATION
DEPT. 373, KENILWORTH, NEW JERSEY

Please enter my order for 10 pieces (one package) of Grade 548 inserts . . . style and size as checked. If at the end of 30 days, for any reason I am not satisfied with their performance I will return all used and unused inserts and my order will be automatically cancelled . . . at no charge.

	BLANK ORDER NO.	I.C.	A.	T	R	PRICE	CHECK ONE
TRIANGULAR PRECISION-GROUND NEGATIVE RAKE 	TB-12P22	3/8		1/8	1/32	AS PER CURRENT ADAMAS CATALOG	☐
	TB-12P32	3/8		3/16	1/32		☐
	TB-12P33	3/8		3/16	3/64		☐
	TB-16P32	1/2		3/16	1/32		☐
	TB-16P33	1/2		3/16	3/64		☐
SQUARE PRECISION-GROUND NEGATIVE RAKE 	SQ-16P22		1/2	1/8	1/32		☐
	SQ-16P32		1/2	3/16	1/32		☐
	SQ-16P33		1/2	3/16	3/64		☐
	SQ-24P32		3/4	3/16	1/32		☐
	SQ-24P33		3/4	3/16	3/64		☐
	SQ-24P34		3/4	3/16	1/16		☐

I would like a style (or size) other than listed above
Please send me: _____

NAME _____ TITLE _____

COMPANY _____

STREET _____

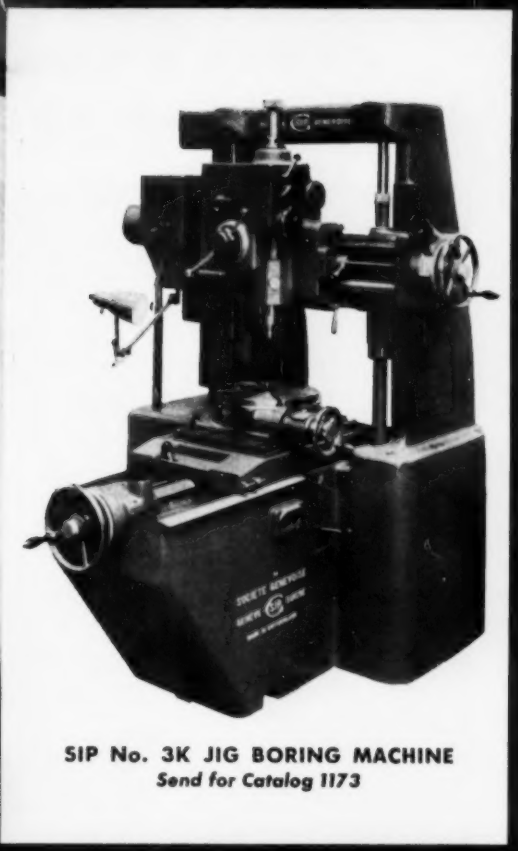
CITY _____ STATE _____

GRADE 548 IS SPECIFICALLY RECOMMENDED FOR MACHINING: LIGHT TO MEDIUM CUTS, LIGHT INTERRUPTED CUTS

Tough Alloy Steels:

3000	300 Stainless
4000	400 Stainless
5000	Tool Steels
6000	Monel
52100	Inconel
8600	Nitraloy

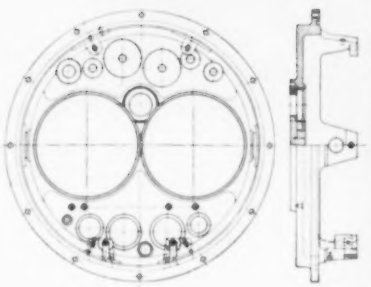
ADAMAS
CARBIDE CORPORATION
KENILWORTH, NEW JERSEY
Producers of Tungsten Carbide Tools, Tool Tips, Dies, Wear Parts, Dex-A-Tool

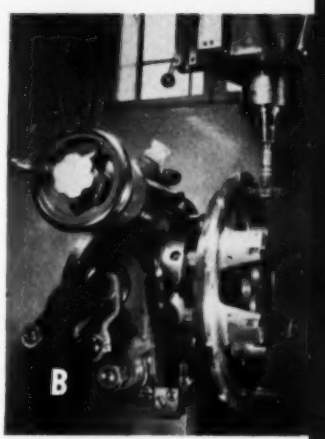


SIP No. 3K JIG BORING MACHINE
Send for Catalog 1173

Illustrated is the machining of a magnesium casting for an electronic unit . . . (A) drilling, boring and counterboring 37 holes, 62 diameters ranging from 0.255″ to 5.125″ . . . (B) drilling, boring and counterboring 11 holes, 16 diameters ranging from 0.100″ to 0.787″. Here's the record:

MACHINING TIME (A).....8 HOURS, 15 MINUTES
MACHINING TIME (B).....2 HOURS, 0 MINUTES





How's that for Production!

The machine that does it is the SIP No. 3K Jig Boring Machine. It has what it takes—ease of operation, increased generous range and capacity, plus the basic Precision that is SIP—to finish critically sensitive jobs like this so fast and so well! SIP quality and precision cost you no more.

and how's this for
Accuracy?

HOLE DIAMETERS HELD TO
+0.0004", −0
CENTER DISTANCES HELD TO
+0.00025", −0

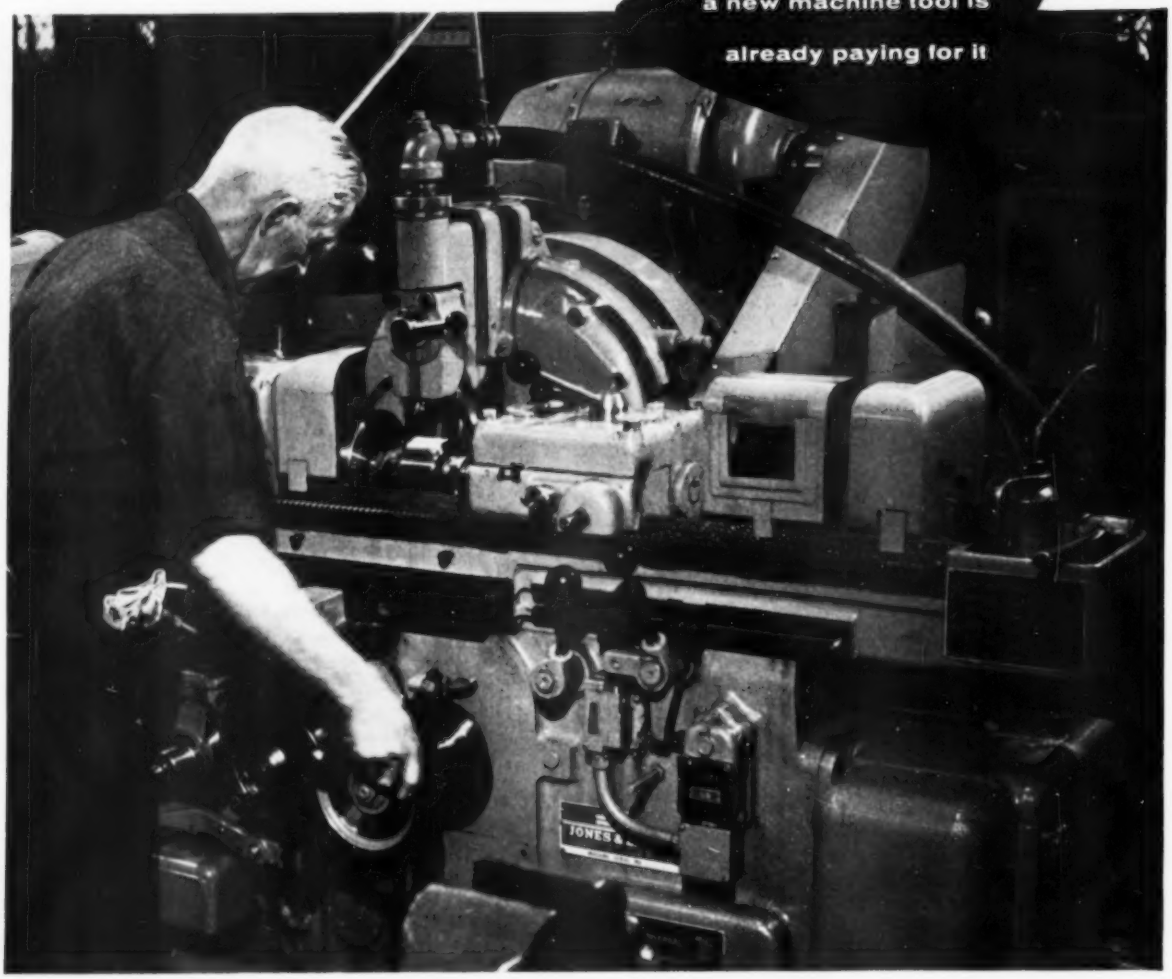
SIP *makes Precision Production Practical & Profitable*

AMERICAN SIP CORPORATION
100 EAST 42nd STREET, NEW YORK 17, N. Y.

Since 1926 all SIP Machines delivered to U.S.A. and Canada have been calibrated in the INTERNATIONAL INCH (1″ = 25.4 mm).

JONES & LAMSON MACHINE TOOLS

the man who needs a new machine tool is already paying for it



Close Tolerance Tool Room Work on an Automatic machine with Universal Application

A customer writes: "The versatility of Jones & Lamson Thread Grinders is scarcely tested in the conventional production of hobs, taps, gages and threaded parts. In our toolroom, using the thread grinder as a basis for 'Rube Goldberg' development, we have produced precision racks, small form-profiled milling cutters, oil grooves and grinding wheel crushers.

"While serving the purpose as a necessary piece of equipment, this machine also provides a means by which many additional production problems can be explored and tested. Applying the thread grinder to toolroom problems is putting the best foot forward for quickly producing accurate and dependable shop accessories."

* * *

Write for catalog 600. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

double value

from "DOUBLE LO-HUNG" SPINDLE DRIVE . . .

"AMERICAN" Hole Wizards Provide:

1. ***High spindle speeds at low gear velocities.***
2. ***Heavy drilling, boring and large tapping speeds at low tooth pressures.***
3. ***Faster tapping through spindle reverse speed-up.***

The "Double Lo-Hung" Spindle Drive is an exclusive "AMERICAN" Hole Wizard feature. This drive divides the speed range into two separate ranges; the high speeds through a small gear to minimize gear velocities; the low speeds through a large gear to reduce gear tooth pressures under severe service.

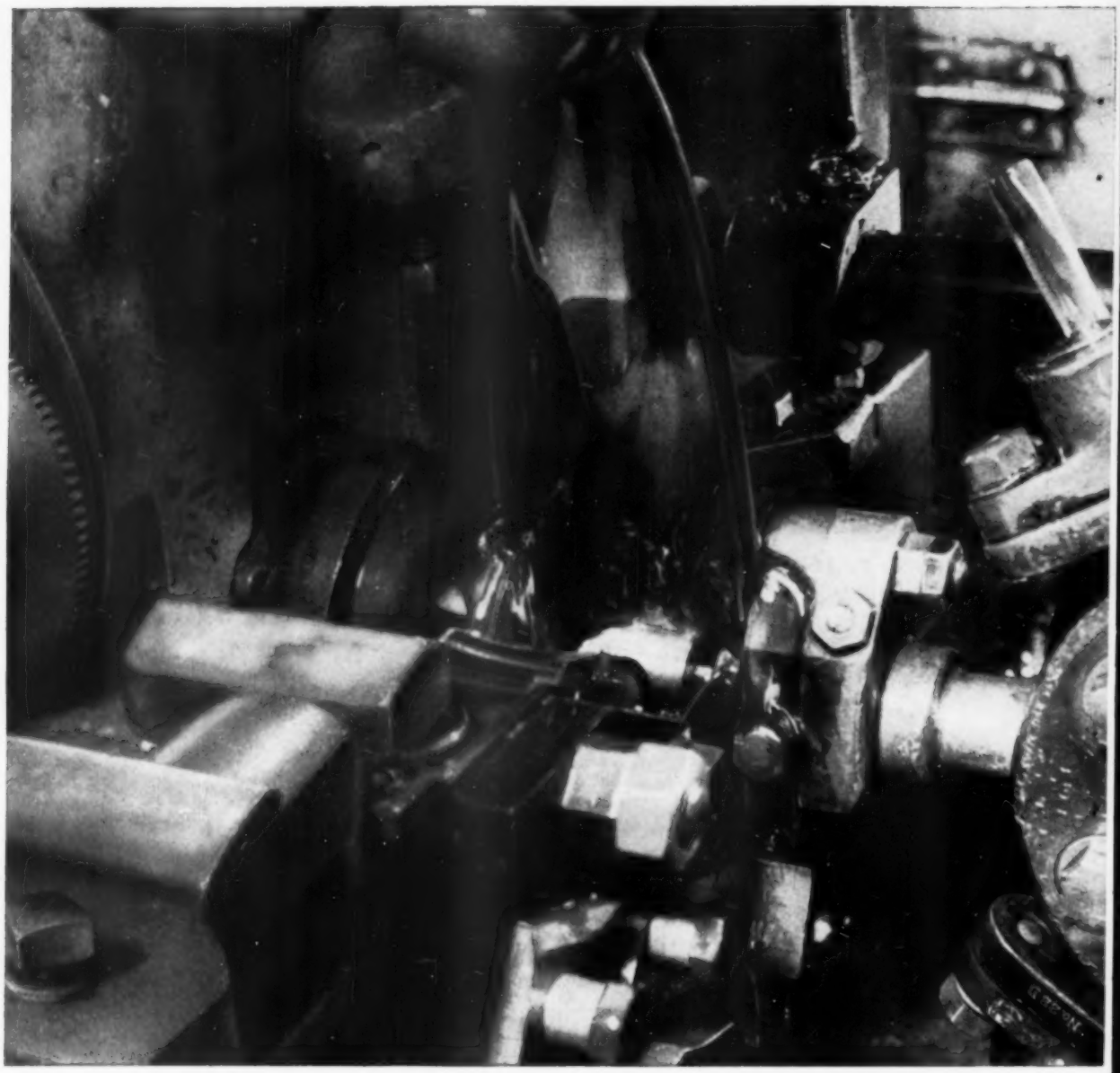
This design in combination with its nitrided Spindle and Sleeve, Timken Mounted with outside adjustment for Spindle Bearings, guarantees maximum life, dependable operation and spindle stability for "AMERICAN" Hole Wizards unequalled by other designs.

• ***Bulletin No. 328 tells the story***

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

CIRCLE 205 READER SERVICE CARD



Gold Micrometer winner describes Gulfcut 45B as "the

GULF MAKES THINGS

In 1954, the National Screw Machine Products Association awarded the Gold Micrometer to Mr. Emil Johnson, for 40 years of distinguished service to the industry. Mr. Johnson is Vice-President and Superintendent of Connecticut Manufacturing Company, in Waterbury, Connecticut.

Now, with over 44 years of experience with screw machines and cutting oils, Mr. Johnson describes Gulfcut 45B as "the best cutting oil we have ever used for those tough jobs."

Connecticut Manufacturing produces precision parts in all metals for the automotive, electrical, firearms, and toy industries. They have a well-balanced shop equipped with automatic screw machines, cold headers, slotters, knurlers and thread rollers.

To prove his point on the superiority of Gulfcut 45B, Mr. Johnson selected a job in the shop involving the machining of a flush rod, part of a valve assembly made by a well-known plumbing company.

"On this job," he said, "the customer specified heavy

Precision production of these valve assembly flush rods, at Connecticut Manufacturing Company, rolls in high gear with Gulfcut 45B as the coolant-lubricant. Piece is machined from ¼-inch stock of tough monel metal.

Mr. Emil Johnson, left, winner of Gold Micrometer award, shows finished pieces to Peter Eaton, Gulf Sales Engineer. Mr. Johnson uses Gulfcut 45B for all the tough machining jobs at Connecticut Manufacturing Company.

best cutting oil for the tough jobs"...

RUN BETTER!

draft and strain-tempered monel metal. Monel is tougher to cut than most metals. But with a workhorse cutting oil like Gulfcut 45B, we can hold to extremely close tolerances, provide good finish, and do it at higher speeds with less friction. We use Gulfcut 45B on all our tough jobs."

See how Gulf makes things run better. Whatever type of machining you do, there's a shop-tested Gulfcut cutting oil to meet your needs. Call a Gulf Sales Engineer at your nearest Gulf office, or mail the coupon.

GULF

GULF OIL CORPORATION
Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.

Send me more information on:

☐ Gulfcut "Regular" Cutting Oils.
☐ Gulfcut Heavy Duty Soluble Oils.

Name _____

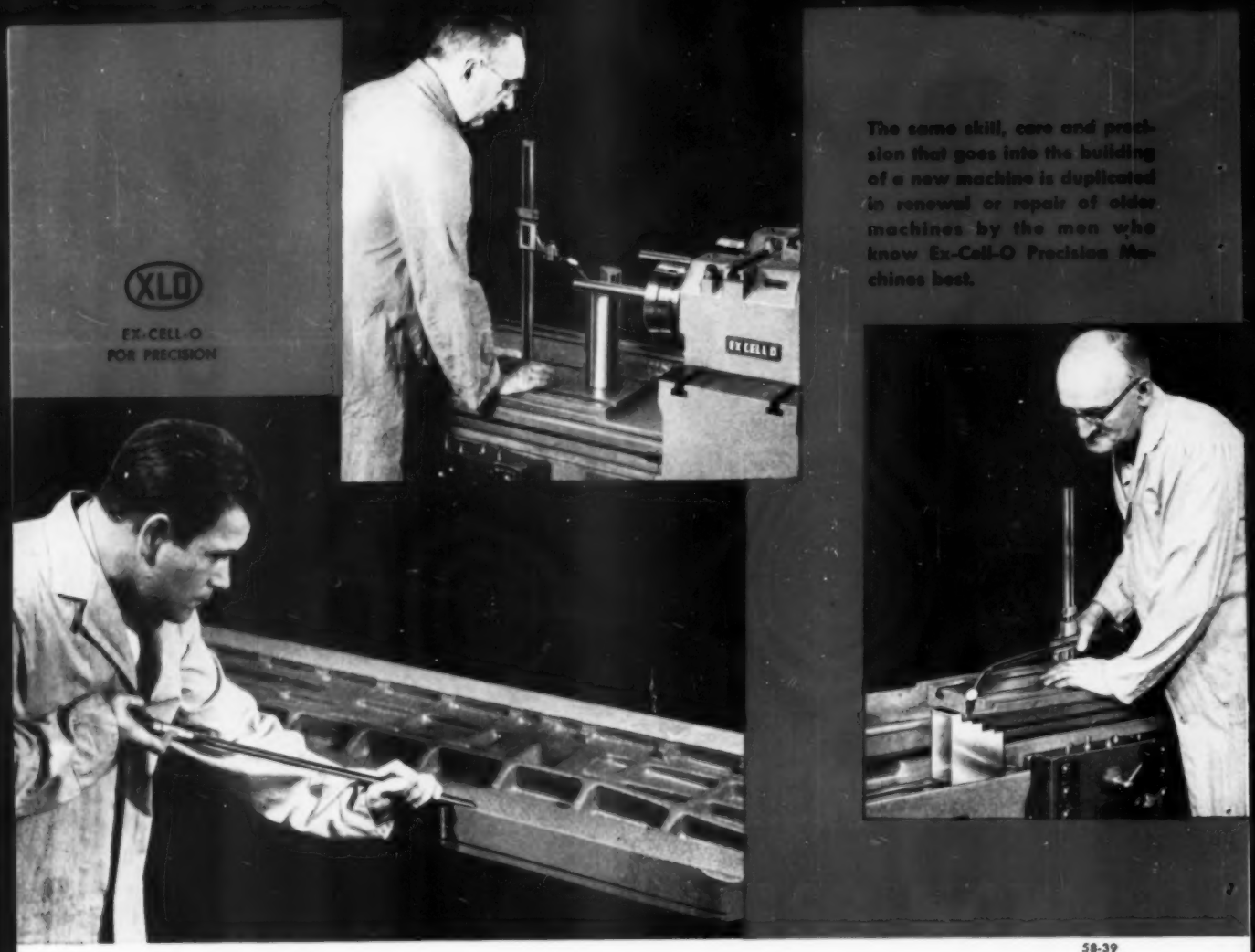
Title _____

Company _____

Address _____

City _____ Zone ____ State _____

AM-0105


XLO
EX-CELL-O
FOR PRECISION
The same skill, care and precision that goes into the building of a new machine is duplicated in renewal or repair of older machines by the men who know Ex-Cell-O Precision Machines best.

58-39

Are you ready for the business upsurge?

RENEW YOUR EX-CELL-O MACHINES NOW!

Better business is just around the corner, and now's the time—when your present Ex-Cell-O equipment may not be in continuous service—to release idle machines for renovation before full production begins once more.

Ex-Cell-O's facilities for machine repair or renewal are geared to your specific needs—whether it's a planned modernization program or an emergency repair job. The service is fast, the workmanship thorough; and, of course, necessary replacements are Ex-Cell-O "original equipment" precision parts.

For complete satisfaction and guaranteed results, put your Ex-Cell-O machines in the hands of the men who know them best. Contact your local Ex-Cell-O Representative, or call direct for complete details.

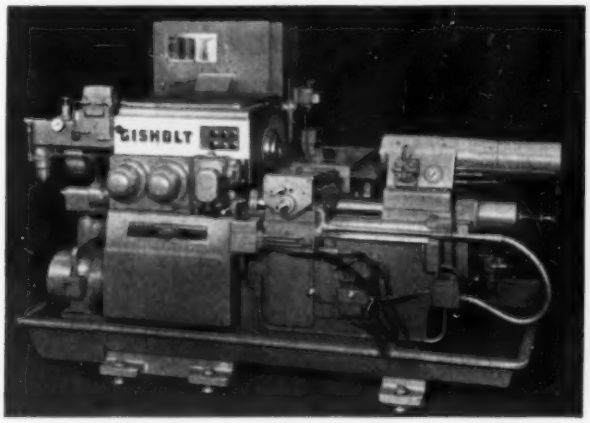
EX-CELL-O CORPORATION *Machinery Division*
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

CIRCLE 208 READER SERVICE CARD

WHICH IS MOST IMPORTANT TO YOU?

Power
Speed
Versatility
Capacity
Quick Setup?



Gisholt No. 12 Automatic Chucking Lathe

You don't have to sacrifice one advantage for another because here is an ideal combination of all in the industry's most modern high-production automatic chucking lathe.

This Gisholt No. 12 is quickly set up to save you time and money on continuous, high-speed production or a wide variety of parts in small lots. It can take practically any part up to 16½" in diameter.

COST-CUTTING VERSATILITY. With 420 spindle speeds ranging from 40 to 2600 r.p.m. and an infinite selection of feeds, it gives you top efficiency in all phases of every job—cutting costs all the way.

INCREASES OPERATOR PRODUCTIVITY. Each machining step is handled in rapid automatic sequence—freeing your operator to handle additional machines.

GREATER POWER, GREATER ACCURACY. Constant h.p. motor (up to 40 h.p.) on the No. 12 takes full advantage of today's most advanced cutting tools and tooling techniques. Greater weight and rigidity allow heaviest cuts at punishing speeds without vibration.

COMPLETE RANGE OF ACCESSORIES. Front, rear, auxiliary and overhead slides can be used; angular cuts are easily made; JETracers can be used with greatest efficiency. Automation can be incorporated—from simple loading and unloading to gaging and sorting of finished pieces.

Your Gisholt Representative will gladly show you how the No. 12 Automatic Chucking Lathe will pay for itself in your plant. Call him, or write for Bulletin 1213.

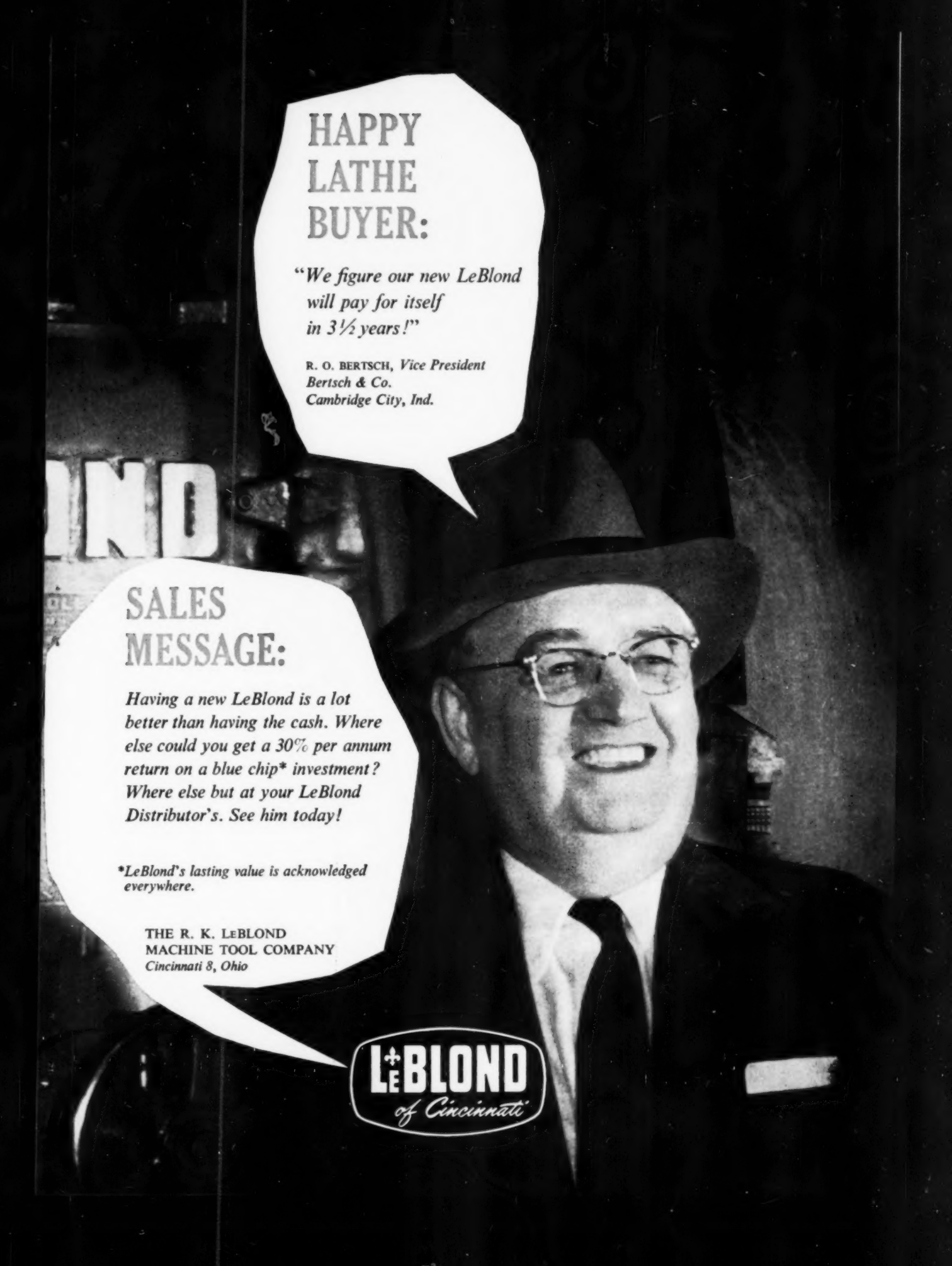
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines • Factory-Rebuilt Machines with New Machine Guarantee

HAPPY
LATHE
SALESMAN:
"This new 50" LeBlond
sold for more
than $100,000!"
O. W. "DOC" SHULL, Sales Engineer
Technical Equipment Sales Co.
LeBlond Indianapolis Distributors

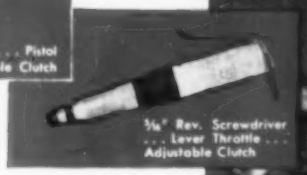

HAPPY LATHE BUYER:
"We figure our new LeBlond will pay for itself in 3½ years!"
R. O. BERTSCH, Vice President
Bertsch & Co.
Cambridge City, Ind.
SALES MESSAGE:
Having a new LeBlond is a lot better than having the cash. Where else could you get a 30% per annum return on a blue chip* investment? Where else but at your LeBlond Distributor's. See him today!
*LeBlond's lasting value is acknowledged everywhere.
THE R. K. LeBLOND
MACHINE TOOL COMPANY
Cincinnati 8, Ohio
LeBLOND
of Cincinnati

COMPARE!

The new ROTOR "01" SERIES air powered Nutsetter/Screwdriver

Ask for a demonstration of the new Rotor "01" Series Nutsetters/Screwdrivers on your assembly jobs! Compare them for quietness, light weight, compactness, ease of handling.

Available in ¼" to 7/16" capacity . . . in different combinations of speeds, throttle handles, clutches with internal or external chucks . . . reversible and non-reversible. Also, a complete line of Rotor "01" drills and angle tools. Write for catalog.



ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders • Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers • Special Tools • Air Motors

ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

ROTOR TOOLS
CLEVELAND, OHIO

One

PROFIT PICTURE

after another

—with

SPIRAL POINT*

Every day, all kinds of drilling installations are proving that Spiral Point transforms a standard twist drill into a cost-reducing, precision tool.

On this alloy steel Universal Link, a manufacturer of hydraulic equipment ELIMINATED TWO MACHINING OPERATIONS—*the result of Spiral Point's self-centering drilling action!*

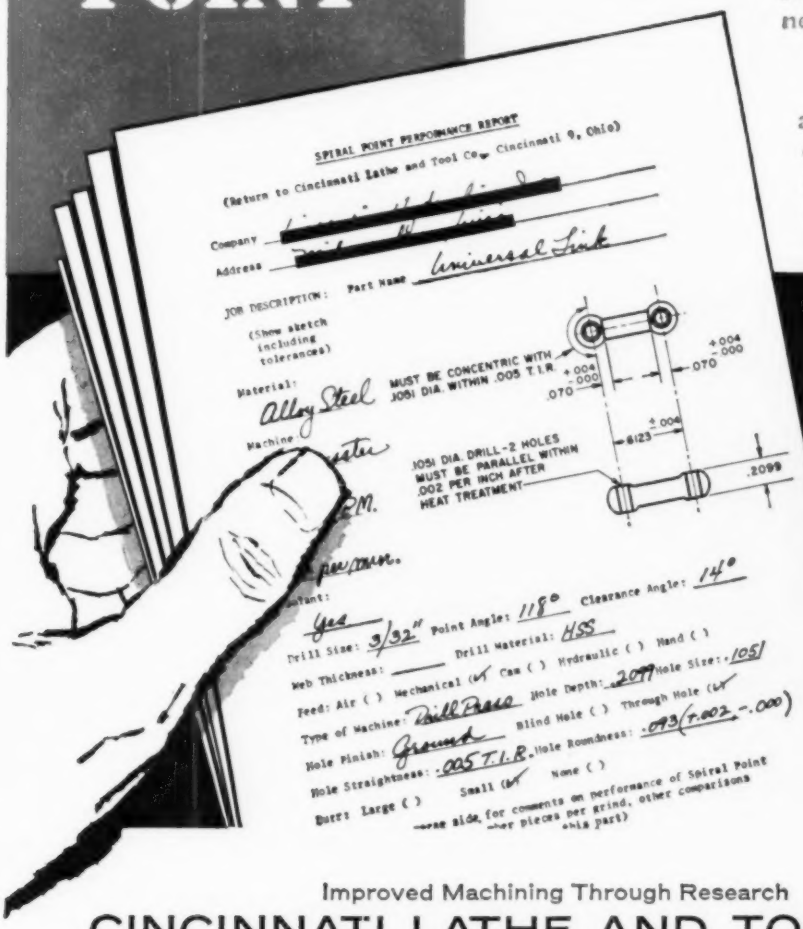
To hold concentricity and parallelism, previous methods of machining required spot milling both holes with a special end mill, then drilling and reaming undersize, with a final grinding operation after heat treatment to complete the part.

With a Spiral Point grind using 118° point angle and 14° clearance on 3/32" HSS drills, tolerances were held consistently. Only drilling and finish grinding after heat treatment were needed.

Why not convert the twist drills in your plant into precision Spiral Points? The new Cincinnati

SPIROPOINT®
DRILL SHARPENER

automatically applies this cost-saving new point geometry in a matter of seconds! Ask your C L & T Dealer, or write us direct.


SPIRAL POINT PERFORMANCE REPORT
(Return to Cincinnati Lathe and Tool Co., Cincinnati 9, Ohio)
Company
Address
JOB DESCRIPTION: Part Name Universal Link
(Show sketch including tolerances)
Material: Alloy Steel
MUST BE CONCENTRIC WITH .1051 DIA. WITHIN .005 T.I.R.
.070
.1051 DIA. DRILL-2 HOLES MUST BE PARALLEL WITHIN .002 PER INCH AFTER HEAT TREATMENT
.2099
Drill Size: 3/32" Point Angle: 118° Clearance Angle: 14°
Web Thickness: Drill Material: HSS
Feed: Air ( ) Mechanical (✓ Cam ( ) Hydraulic ( ) Hand ( )
Type of Machine: Drill Press Hole Depth: .2099 Hole Size: .1051
Hole Finish: Ground Blind Hole ( ) Through Hole (✓
Hole Straightness: .005 T.I.R. Hole Roundness: .093(+.002 -.000)
Burr: Large ( ) Small (✓ None ( )
(use side for comments on performance of Spiral Point other pieces per grind, other comparisons this part)

* With CINCINNATI's Spiral Point, new drill point geometry, you get accurate hole size — straighter, rounder, cleaner holes — and you eliminate secondary operations; maintain hole-positioning accuracy without costly guide bushings or pre-centering; get more holes per grind.

Improved Machining Through Research

CINCINNATI LATHE AND TOOL CO.

3207 Disney Street • Cincinnati 9, Ohio

"TRAY-TOP" Lathes / "CINCINNATI" Drilling Machines / "SPIROPOINT" Drill Sharpeners

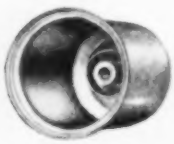
MUELLER BRASS CO. OFFERS 7 WAYS TO PRODUCE YOUR PART

Mueller Brass Co., because of its diversified manufacturing facilities that encompass a wide range of fabricating methods, is in the unique position of being able to offer you, the purchaser, an intelligent, unbiased analysis and recommendation of the best, most economical method by which your particular part can be produced. As the result of over 40 years' experience, the "Methods Analysis Department" has at its command complete knowledge of the advantages and limitations of each production process. After receiving detailed knowledge concerning the end use of the part, material specified, conditions under which it must operate and other pertinent factors, these analysis engineers make their recommendations. Every detail is considered. In many cases, methods analysis engineers recommend a simple design change that makes practical a much more economical method of production. This technical service, offered only by Mueller Brass Co., is given to each individual inquiry and is your assurance that you will get the best product at the best price . . . made the one best way . . . by Mueller Brass Co.

Send today for free technical literature on any one or all of the seven fabricating methods.

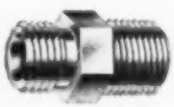
FORGINGS

Production equipment is available to produce press, hammer or cored forgings of any practical shape in sizes ranging from a few ounces to 150 lbs. in brass, bronze, aluminum and magnesium in 27 standard, as well as special, alloys.



COLD-PREST® IMPACT EXTRUSIONS

Mueller Brass Co. has complete machinery for producing Cold-Prest impact extrusions of aluminum, copper, brass, bronze and steel. Extrusions up to 28" in length are possible, depending on wall thickness and other design details. Parts can be designed having ribs, flutes, splines or bosses . . . with multiple wall diameters and with uniform or tapered wall sections.



SCREW MACHINE PRODUCTS

Mueller Brass Co. has one of the world's largest automatic screw machine departments fabricating both ferrous and non-ferrous custom parts. We can produce an infinite variety of shapes and sizes from ⅛" to 3¼" in wide range of free cutting and specialized alloys. Complete facilities for all secondary and finishing operations, as well.

POWDER METAL PARTS

Mueller Brass Co. can supply precision Sinteal® powder metal parts in wide range of sizes and metals at high production rate. Parts available from iron, brass and copper alloys. Parts may be ordered with such characteristics as self-lubrication, controlled porosity and good electrical and magnetic properties.

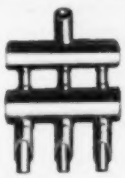
MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

MUELLER BRASS CO.

...and our methods analysis service helps you determine which is the best ...and most economical method

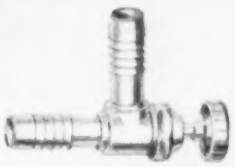
SAND CASTINGS

We specialize in the production of pressure-tight red brass castings. We utilize both metal match plate and wood patterns. Facilities include tool room and pattern shop, electric melting furnaces, high capacity core room and both bench and floor molding equipment to handle wide range of sizes.



FORMED COPPER TUBE

Mueller Brass Co. has modern facilities for forming seamless copper tube into a multitude of shapes. Forming methods used include bending, spinning, expanding or swedging, upsetting, flaring, flattening, beading and grooving, drilling and piercing, machining and joining. Formed copper tube coils are also available as single, double, spiral and serpentine shapes.



PLASTIC INJECTION MOLDING

Injection molding of plastic parts is still another process offered by the Mueller Brass Co. Parts are molded from such plastics as—nylon, polyethylenes, polyvinyl chloride, styrenes, linear acetal, chlorinated polyether, polycarbonates or polypropylene, dependent on part application.

MAN FROM MUELLER BRASS CO.

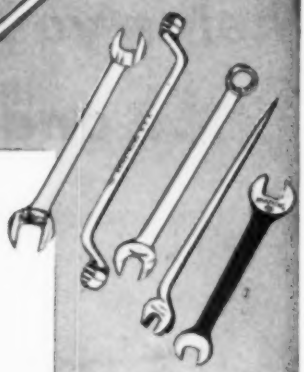
Since only Mueller Brass Co. can produce your part by all the methods, only the Man From Mueller Brass Co. can give sound advice on the one best method of production. Over 40 years of research, engineering, manufacturing and marketing experience stands behind him. When you are specifying and purchasing fabricated metal parts, call in the **MAN FROM MUELLER BRASS CO.**

271

PORT HURON 24, MICHIGAN

ARMSTRONG

Quality TOOLS



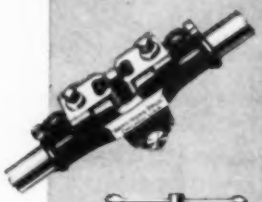
More than meets the eye

There are extra values in ARMSTRONG TOOLS that become apparent only with use.

TOOL SENSE— convenience in use — the most efficient *"tool approach"* built into ARMSTRONG Tool Holders; the balance and *"feel"* of an ARMSTRONG Wrench; the *rigidity* of ARMSTRONG "C" Clamps; the extra *toughness* of ARMSTRONG Lathe Dogs and Eye Bolts; the universal *adaptability* of ARMSTRONG Set-up and Hold-down Tools — the evidence of "tool sense", the understanding of each tool's requirements.

STRENGTH — built into each individual ARMSTRONG TOOL is a safety factor of extra *strength* — *strength* beyond any need, the inherent strength of specially selected materials enhanced by proper heat treatment and hardening.

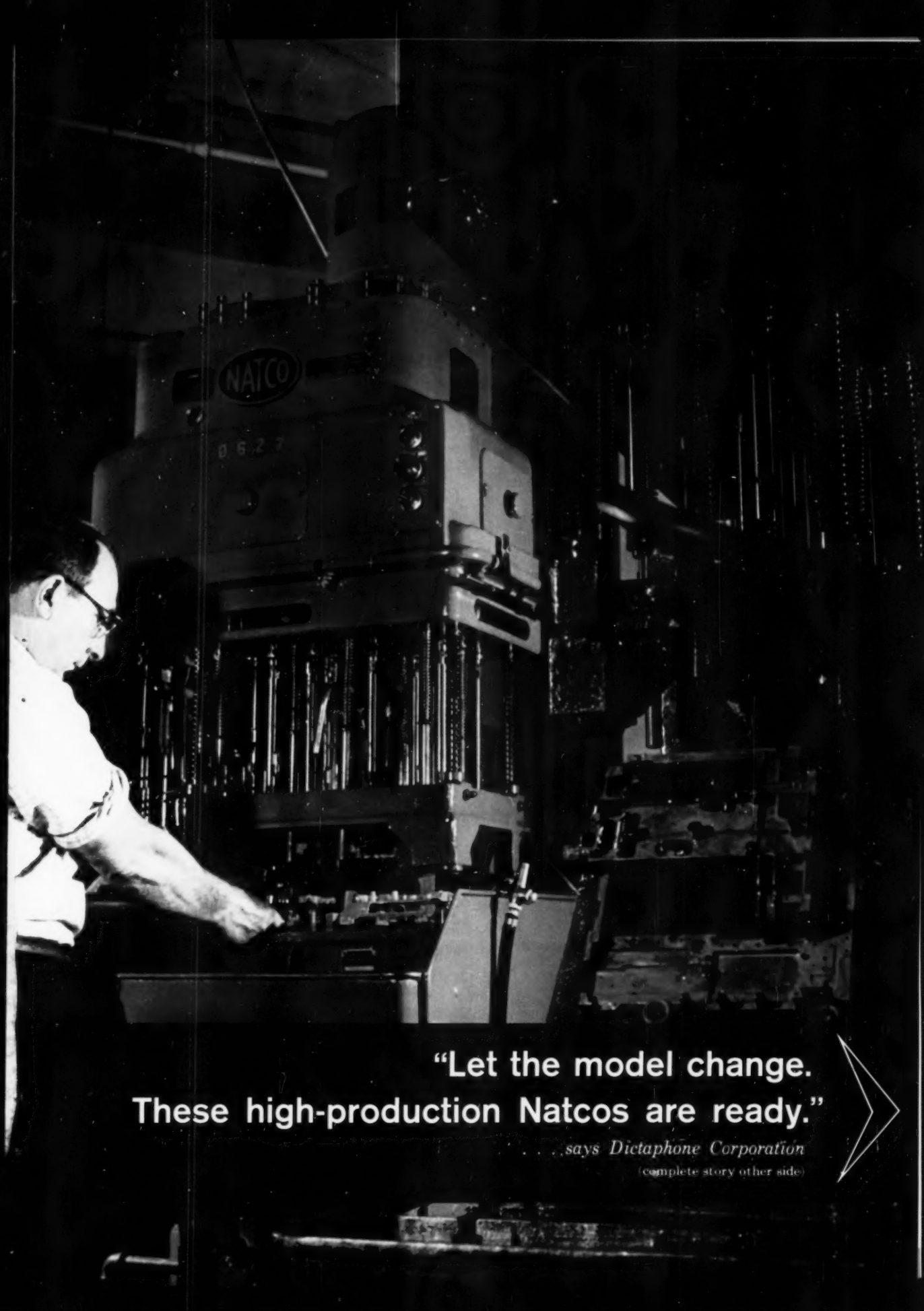
UNIFORM QUALITY — the uniform quality made possible by modern manufacturing methods, in a specially-built plant equipped with every needed quality control. The name ARMSTRONG with the Arm-and-Hammer Trade Mark is universally recognized as a guarantee of finest quality.



ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVE., CHICAGO 46, ILL.



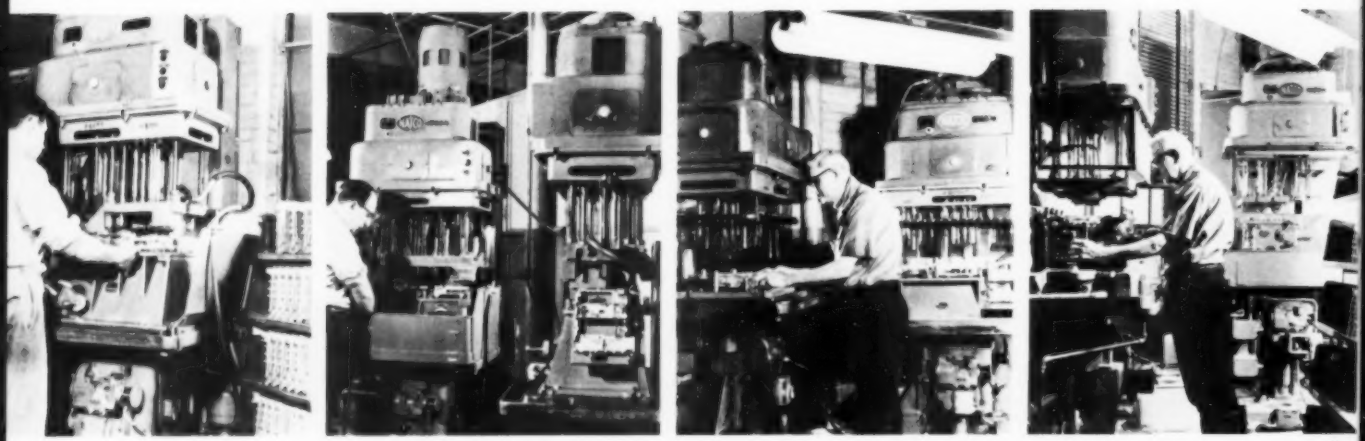
"Let the model change. These high-production Natcos are ready."

. . . says Dictaphone Corporation

(complete story other side)

Five parts for the cost of one!

Fast changeover too!



These 7 standard Natcos do it for Dictaphone!

Costs toppled 81%, savings exceeded $1.00 per part when Dictaphone Corporation, Bridgeport, Conn., switched from gang drill production to this line of seven high-production H-6 Natcos. *Standards*, not specials. They quickly convert when models change; and replacement parts for old models can be run on the same line with minimum time for changeover.

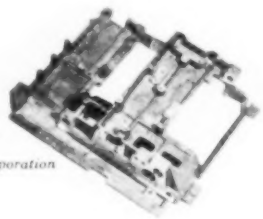
Dictaphone's part is a magnesium main frame for its Time-Master dictating machine. It calls for drilling 97 holes and performing 150 secondary operations—reaming, tapping, counterboring and countersinking on most of them. The seven multi-spindle Natcos handle all but 16 of these operations.

Besides increasing production 81 per cent, the seven Natcos eliminate skipped and creeping holes, and maintain close tolerances. Natco tooling locates the magnesium parts without warping stresses.

On the Natco H-6, the slip plate is the key to flexibility. For example, Dictaphone transferred four Natcos from other assignments, simply by fitting them with new slip spindle plates and, of course, new fixtures. Three new Natcos filled out the line.

Natco H-6 and other multi-spindle drilling machines are available in models from 1 hp with 10 spindles to 50 hp with up to 72 spindles. Write today for complete details or see your Natco representative.

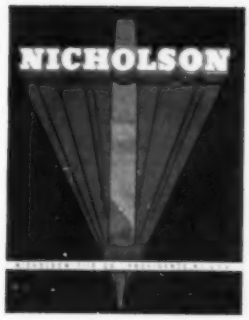
Under the cover of
the Time-Master *,
. . . profits in 97 holes.



*Registered trademark of Dictaphone Corporation

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, IND.



Fastest way to find any *file.* There isn't a file you can't find and get fast. First look in your Nicholson or Black Diamond Catalog. Then call your Nicholson or Black Diamond Industrial Distributor. • There are thousands of different files. There are General Purpose varieties for the usual kind of work. There are Special Purpose files to improve the work on specific materials—brass, lead, aluminum and steels, for example. Your Nicholson or Black Diamond File Distributor can meet your requirements for all file needs. • If you have a problem that calls for an entirely different kind of file, we'd like to work with you to solve it. Our research laboratory is available to you for this. • Your Nicholson or Black Diamond File Distributor is the man to call first if the subject is Files or Filing. Ask him now for a catalog, if you don't already have one. Write to us for "File Filosophy," a useful reference on files and filing.

Industrial Distributors provide the finest goods and services in the least possible time. Our products are sold exclusively through them.

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NICHOLSON

NICHOLSON FILE COMPANY, PROVIDENCE, RHODE ISLAND

◄ CIRCLE 218 READER SERVICE CARD

CIRCLE 219 READER SERVICE CARD

NEW

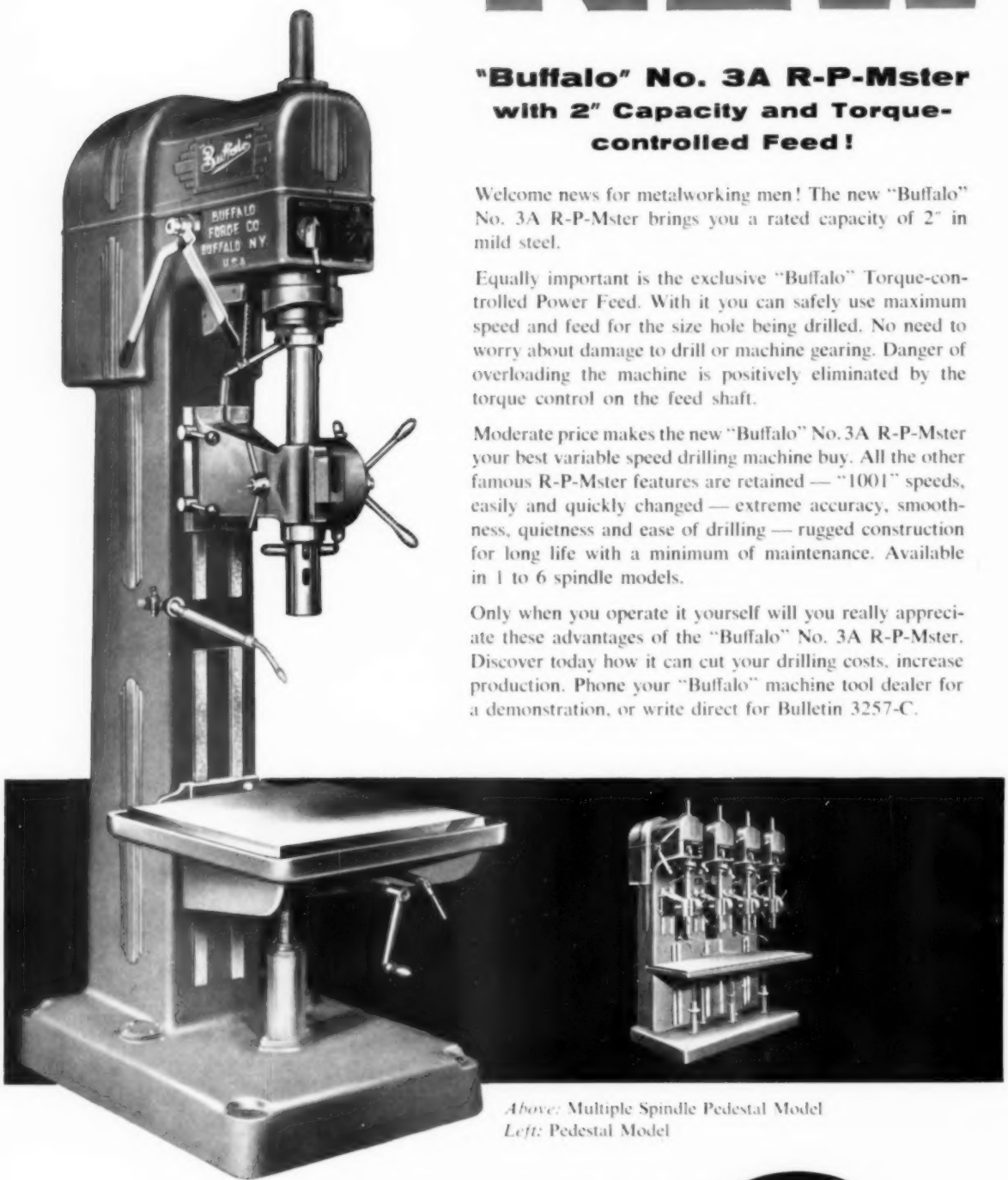
"Buffalo" No. 3A R-P-Mster with 2" Capacity and Torque-controlled Feed!

Welcome news for metalworking men! The new "Buffalo" No. 3A R-P-Mster brings you a rated capacity of 2" in mild steel.

Equally important is the exclusive "Buffalo" Torque-controlled Power Feed. With it you can safely use maximum speed and feed for the size hole being drilled. No need to worry about damage to drill or machine gearing. Danger of overloading the machine is positively eliminated by the torque control on the feed shaft.

Moderate price makes the new "Buffalo" No. 3A R-P-Mster your best variable speed drilling machine buy. All the other famous R-P-Mster features are retained — "1001" speeds, easily and quickly changed — extreme accuracy, smoothness, quietness and ease of drilling — rugged construction for long life with a minimum of maintenance. Available in 1 to 6 spindle models.

Only when you operate it yourself will you really appreciate these advantages of the "Buffalo" No. 3A R-P-Mster. Discover today how it can cut your drilling costs, increase production. Phone your "Buffalo" machine tool dealer for a demonstration, or write direct for Bulletin 3257-C.



Above: Multiple Spindle Pedestal Model
Left: Pedestal Model

BUFFALO FORGE COMPANY
509 BROADWAY BUFFALO, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

DRILLING • PUNCHING • SHEARING • BENDING

REG. U. S. PAT. OFF.

Enter now... SCOTCH BRAND TAPES TAPE-O-RAMA

135 FABULOUS PRIZES

FIVE 1st PRIZES*

Westinghouse Dream Kitchens

or alternate Westinghouse equipment of equal value

EACH KITCHEN INCLUDES:

Refrigerator
Home Freezer
Electric Range
Portable Dishwasher
Laundromat
Clothes Dryer
Appliance Center
Grill-N-Waffler
Electric Fry Pan
Metal Cover
Portable Mixer
Coffee Maker

PLUS 130 OTHER PRIZES
WONDERFUL WESTINGHOUSE APPLIANCES

- 20 **2nd PRIZES:** Choice of refrigerators, ranges or Laundromats
- 25 **3rd PRIZES:** Choice of portable dishwashers or clothes dryers
- 25 **4th PRIZES:** Portable television sets
- 30 **5th PRIZES:** Transistor radios
- 30 **6th PRIZES:** Choice of electric blankets or portable mixers

*3M will pay up to $300 installation charges on all first prize awards.

"SCOTCH" IS A REGISTERED TRADEMARK FOR THE PRESSURE SENSITIVE ADHESIVE TAPES OF 3M CO., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK 16, N.Y. CANADA: LONDON, ONTARIO.

MINNESOTA MINING AND MANUFACTURING COMPANY
...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

MANUFACTURING PERSONNEL...

Easy to enter...easy to win!

Contest open to all personnel of manufacturing plants within the continental limits of the U.S.A., except employees of Minnesota Mining & Mfg. Co., their subsidiaries, their advertising agencies and their families. Entries must describe a new non-electrical usage for "SCOTCH" BRAND Industrial Tapes and/or dispensing equipment which is initiated in the entrant's plant during the TAPE-O-RAMA contest period, February 1, 1959 to June 30, 1959. Winners will be determined on the basis of benefits derived by entrant's plant, and the industry of which that plant is a part.

HURRY—*Get your official entry blank and details from your "SCOTCH" BRAND Tape Distributor or 3M Representative. Use coupon below to request his call, or contact him direct.*

TAPE-O-RAMA CONTEST Dept. GJP, 900 Bush Avenue, St. Paul 6, Minnesota

Name_____

Job_____

Company_____

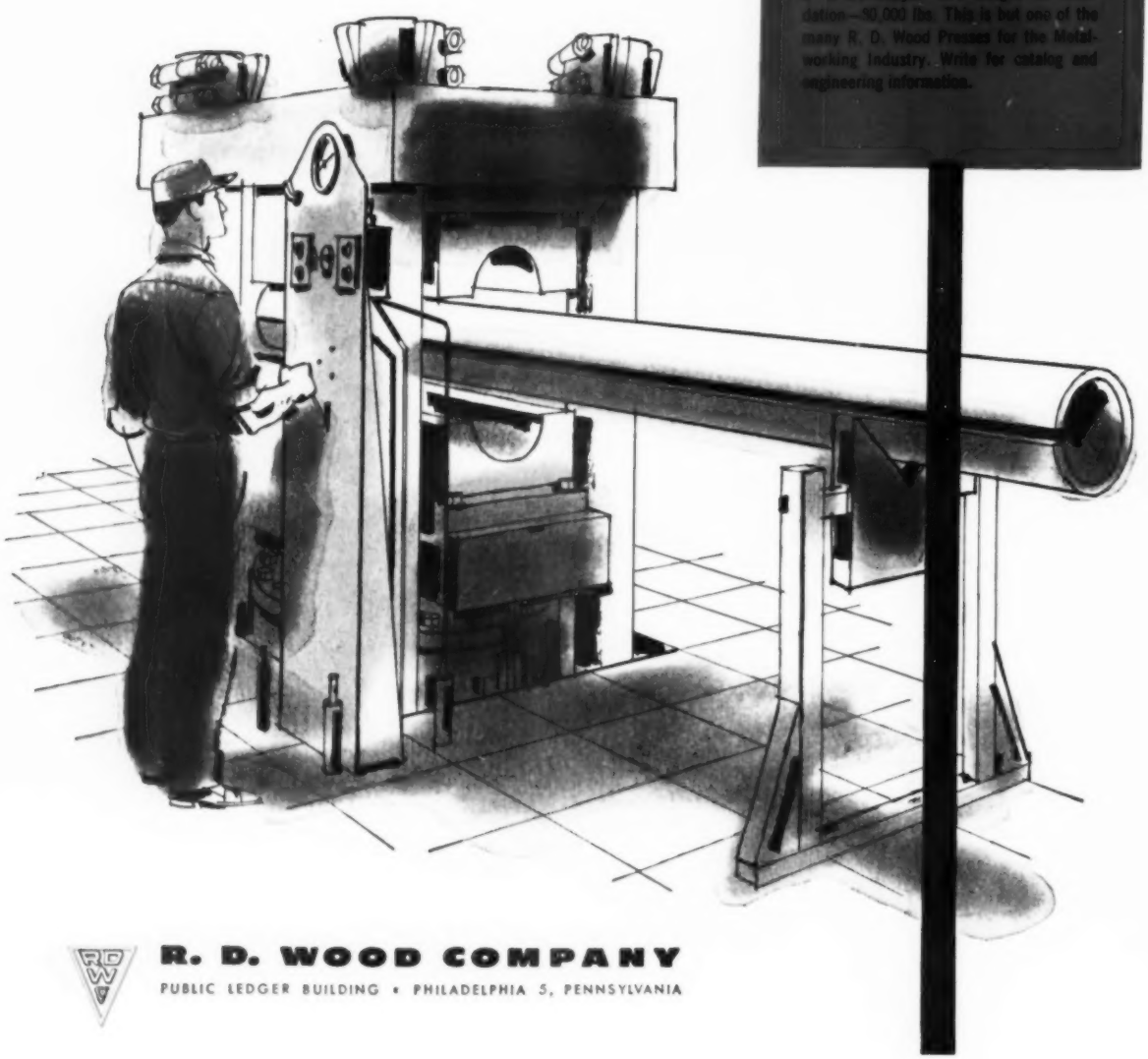
Company Address_____

City_____ Zone____ State_____

You can design your own press at R. D. Wood

Working with numerous basic models, R. D. Wood engineers incorporate your specifications and modifications to produce the press exactly suited to your needs. You can be sure of its quality, too. For every Wood Press is constructed of selected materials by master craftsmen. This is your warranty of dependable performance and precise operation. Why not consult us when planning your next hydraulic press?

1500 ton R. D. Wood Hydraulic Press for pipe forming operations. Press has self-contained pumping unit. Dies can be replaced for various sizes of pipes ranging from 4" to 12". Floor space, press proper—5' x 6'. Height—13'. Weight on foundation—90,000 lbs. This is but one of the many R. D. Wood Presses for the Metal-working Industry. Write for catalog and engineering information.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

Our new idea is a machine. We call it the Panhandler because that's what it does. It handles pans – tote pans. Unloads parts into a plating-processing machine, washes the pans, rinses them, dries them, and returns them for reloading – automatically. By itself, the Panhandler can be used in plants that do no plating, working simply as a pan washer.

In an original layout, the Panhandler can be combined with a new Stevens model C or E machine and installed in a plant as a complete and automated plating-processing-washing operation. In yet another application of this versatile machine, the Panhandler can be added to existing Stevens model C or E machines to achieve labor savings in materials handling.

But however it's put to work, this Panhandler is completely unlike panhandlers as you've known them. Because this Panhandler earns money instead of taking it, and it is surely and regularly saving money for every customer who has installed it.

If you'd like to know how the Panhandler can save an impressive amount of money for you, call your local Stevens sales representative. He'll show you how a Panhandler application can be tailored to your operations.

***Remember*—When you go *automatic* . . . go STEVENS!**

frederic b. **STEVENS,** inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)

Porter-Cable Machine Co. uses 2" Jalcase 100 bars to produce these gears for portable electric belt sanders. Jalcase 100 reduces down time, eliminates heat treating and cuts tool costs.

"Jalcase 100 increased tool life 50%, eliminated need for heat treating"

. . . reports Porter-Cable Machine Co.

"J&L's Jalcase 100 meets our requirements for a steel that satisfies these four specifications:

1. Enough hardness for use in gears and jack shafts without need for heat treating;
2. High machinability for profitable operation without down time;
3. Uniform metallurgical structure;
4. Minimum distortion from residual stresses.

"Our shop experience with Jalcase 100, on six-position automatic machines with up to 21 high speed tools, shows tool life is increased at least 50%, hob life increased 30%," states Porter-Cable Machine Company official, Syracuse, N.Y.

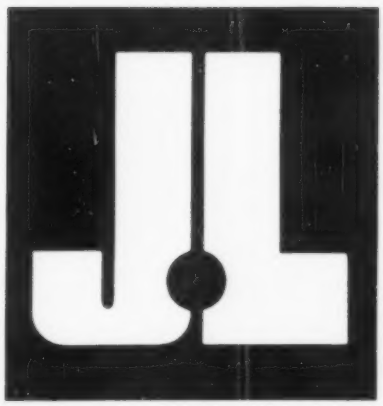
Jalcase 100 is a new grade of Jalcase cold finished steel bars, specially processed for easy machinability with minimum distortion. It features guaranteed minimum yield strengths up to 105,000 p.s.i., guaranteed minimum hardness up to 248 Brinnell, and stabilized residual stresses. A new leaded product known as Jalcase 100-L is believed to be the most machinable high strength steel yet developed.

Call in a J&L steel specialist for a recommendation on the cold finished steel bars best suited for your specific operations. Chances are he can speed your production, cut your machining costs. See your local distributor, or write to Jones & Laughlin, 3 Gateway Center, Dept. 563, Pittsburgh 30, Pennsylvania.

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

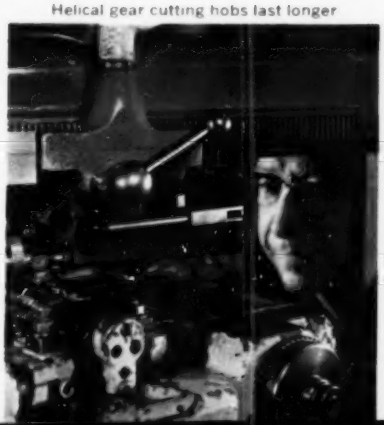
Where cold rolled steels originated in 1859



Final J&L pre-shipment spot inspection

Many bar sizes are used by Porter-Cable

Helical gear cutting hobs last longer

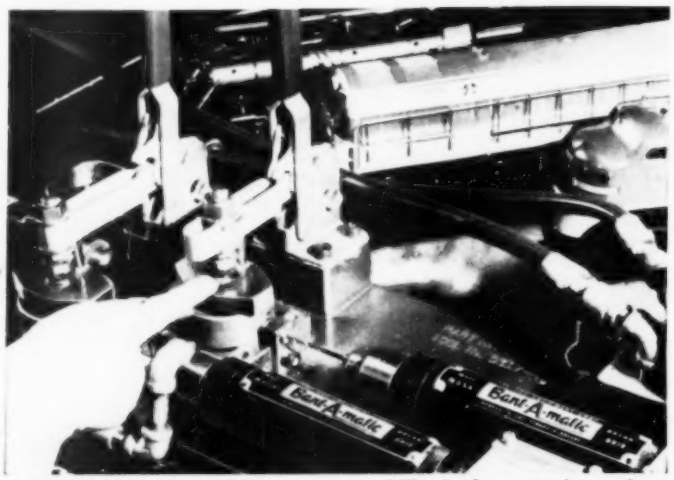


Increased tool life speeds production

High wear resistance is assured

Your Choice!

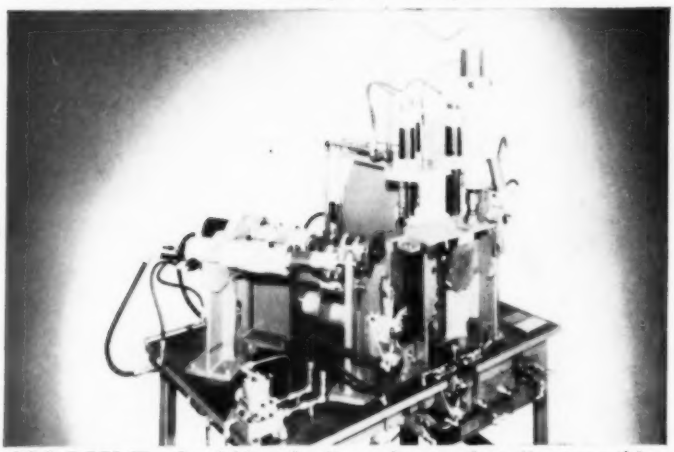
COMPONENTS
You do it!



YOU DO IT—using ARO components! That's the way the makers of Lionel trains automated drilling. They used ARO Bant-A-matics and accessories . . . installed by their own plant men.

OR

COMPLETE PACKAGE
ARO does it!



ARO DOES IT—furnishing the "complete package"—everything from engineering to installation. That's how ARO Automation solved this problem for a maker of automotive parts.

DRILL, TAP, FASTEN *faster* **with**

ARO

AUTOMATION AIR TOOLS

Name your problem in drilling, tapping or fastening . . . ARO can show you a simple way to solve it and step up production!

SINGLE OR MULTIPLE SET-UPS . . . air operated units for widest range of applications. Choice of 4 sizes. Capacities up to ¾". Minimum center to center distance 1".

ARO offers as much help as you need—from components to "complete package" including engineering, fixtures, accessories, automation tools and installation.

Let ARO Automation solve your problems in drilling, tapping, fastening. WRITE or call Aro for the help you need—or contact your Aro Field Representative.

THE ARO EQUIPMENT CORPORATION
Bryan, Ohio
Aro of Calif., 3141 S. Grand Ave., Los Angeles 7, Calif.
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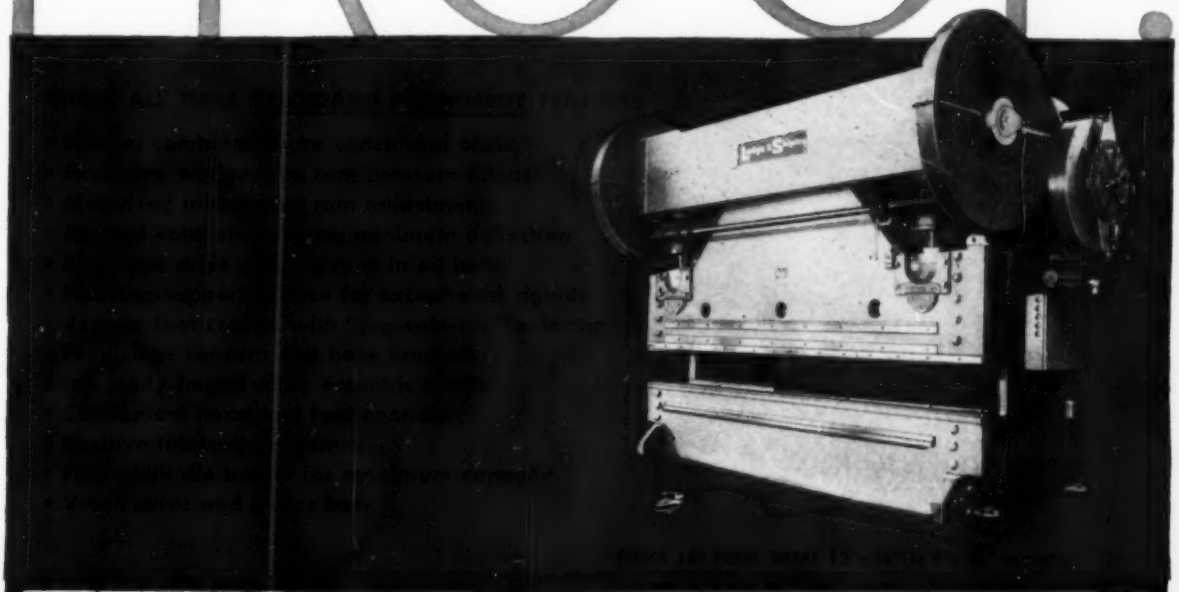
Offices in All Principal Cities

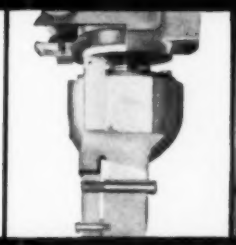
ARO® **AIR TOOLS**
Also Portable Air Tools...
Air Hoists...Air Motors

PROOF!

MORE FOR YOUR MONEY IN A LODGE & SHIPLEY PRESS BRAKE

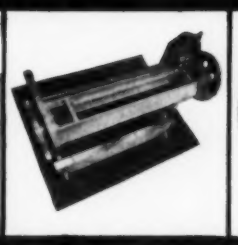


AIR CLUTCH AND BRAKE . . . sensitive, smooth acting and trouble-free — needs no adjustment throughout its life.

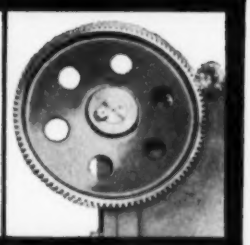


RAM PRESSURE RELEASE . . . exclusive design saves time, dies and machine; operates quickly and easily.

MICRO-RAM ADJUSTMENT . . . push button, direct reading adjustment—includes declutch for adjusting out of parallel.



SOLID STEEL FRAME . . . exceptional rigidity, even at full capacity—two bearings on each eccentric for long life.



EXTRA RUGGED DRIVE . . . spur gearing for efficiency — runs in oil; two-speed drive available at extra cost.

Compare the Lodge & Shipley Press Brake against any other standard equipped brake. You'll pay extra for item after item in the list above. The Lodge & Shipley Press Brake is fully equipped for fast, accurate, versatile and dependable operation. In a few words . . . you *pay no more, get lots more* . . . in a Lodge & Shipley Press Brake.

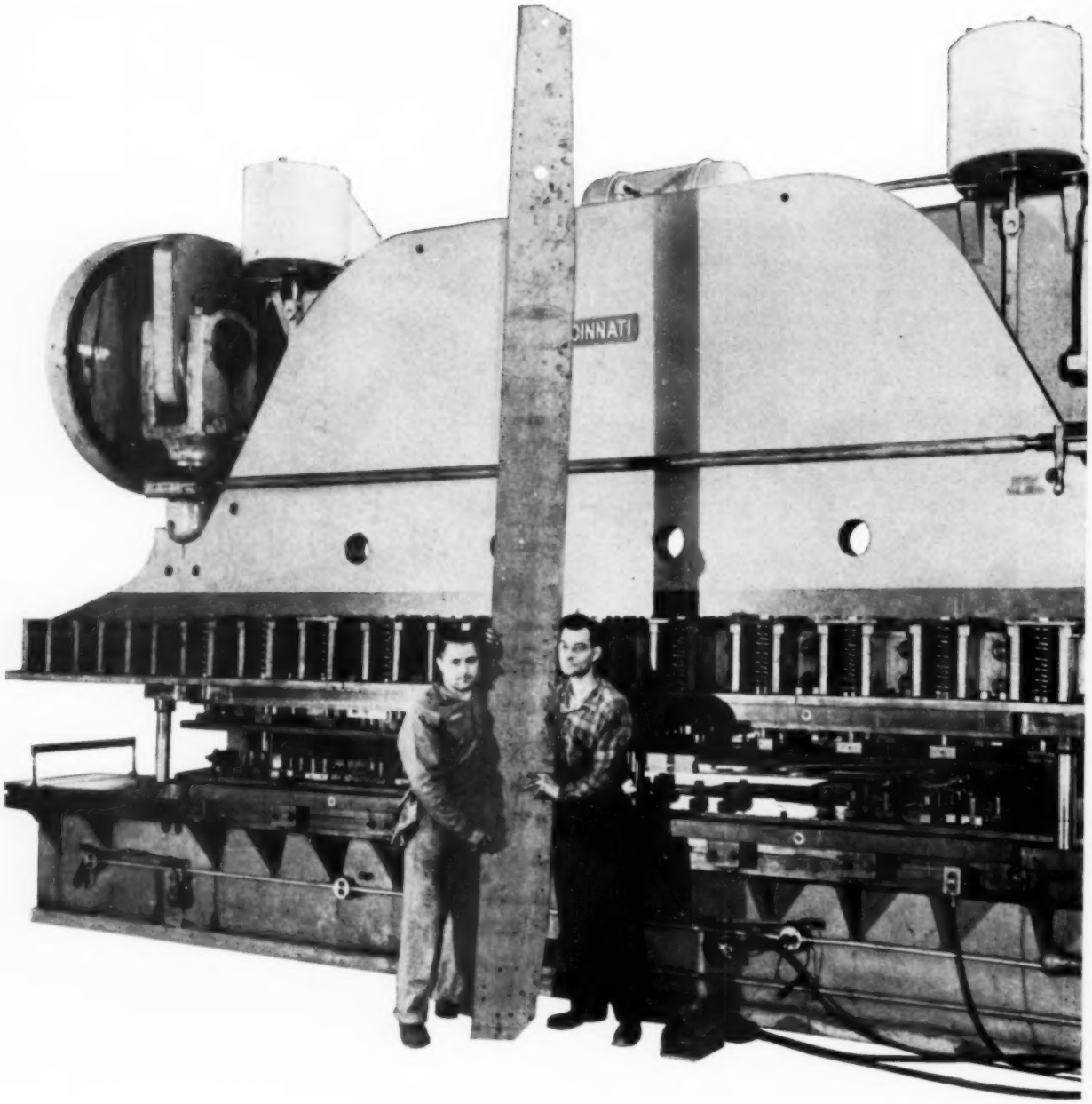
Want complete details? Write for Condensed Catalog PB-8 or mention capacity requirements for specific literature and data.

SEE OUR CATALOG IN SWEET'S

Lodge & Shipley

THE LODGE & SHIPLEY CO., 3056 COLERAIN AVE., CINCINNATI 25, OHIO

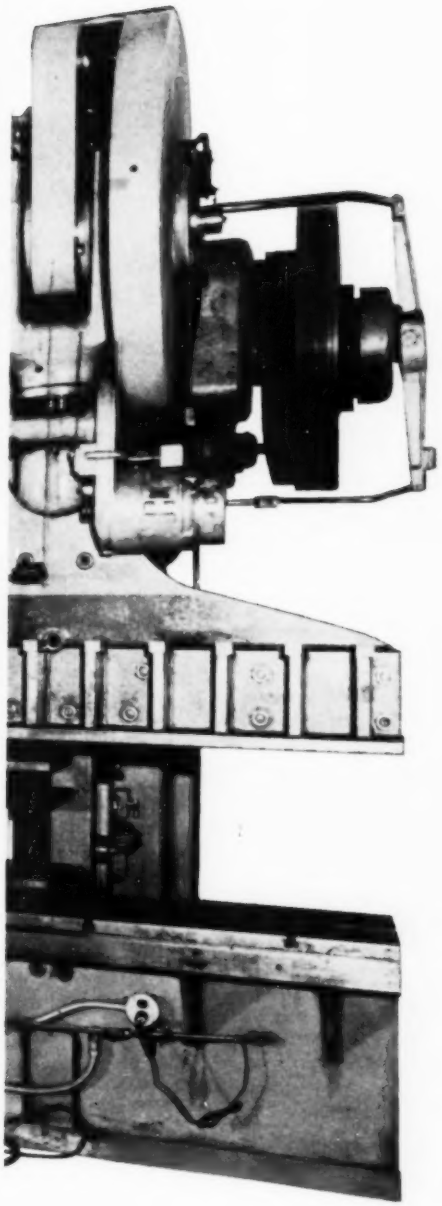
70 minutes

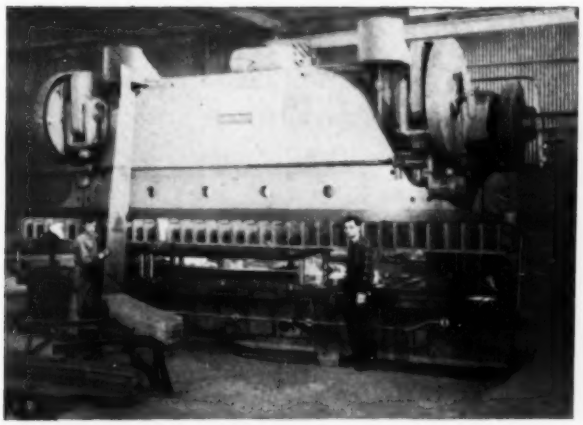


Punching floor-to-floor time cut from 36 to 1⅓ minutes.

Photos courtesy Fort Wayne Structural Steel Co., Inc.

cut to 2.6 min.





Blanking floor-to-floor time cut from 34 to 1¼ minutes.

In combined blanking and punching operations, production time has been cut 96.2% on these long truck side rail reinforcements, thanks to the versatility of this Cincinnati® All-Steel Press Brake.

Operating data, furnished by John L. Hayner, President Fort Wayne Structural Steel Co., Inc., show how his company substantially slashed production costs.

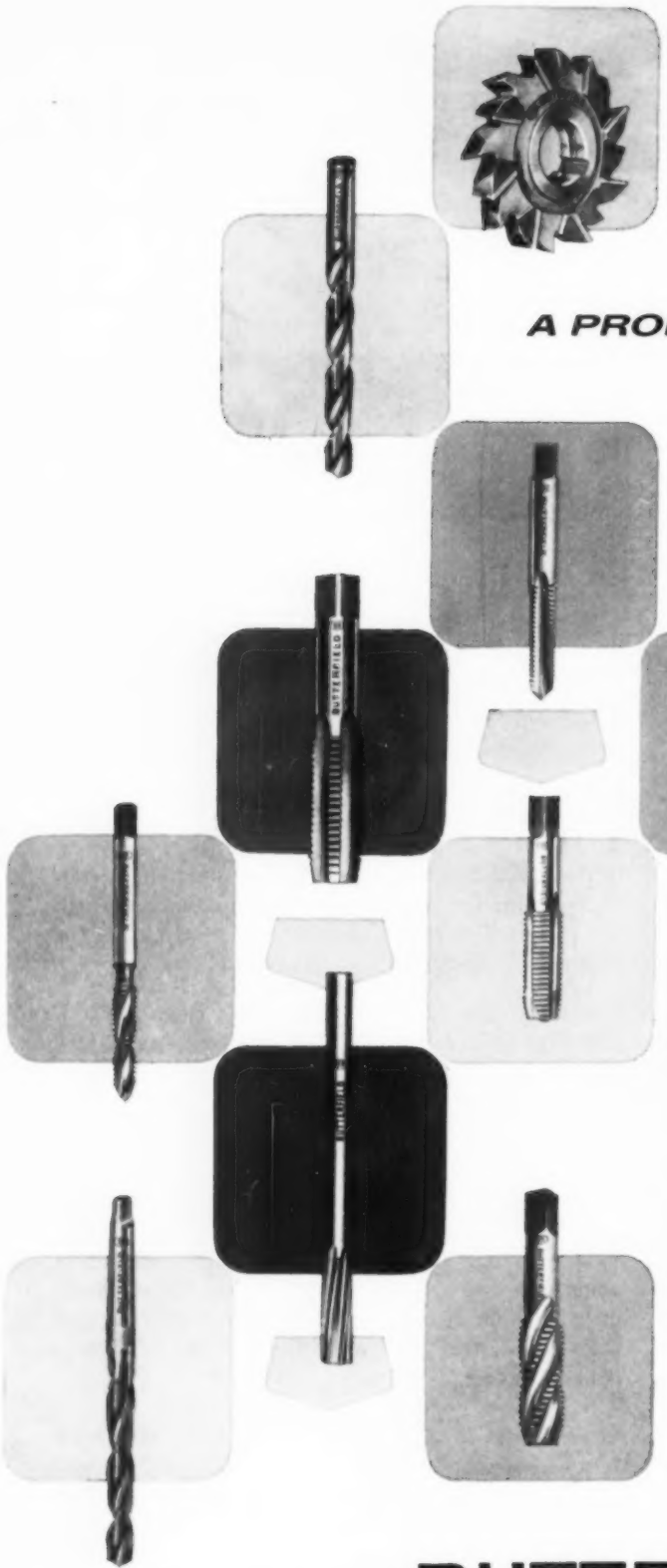
They decreased floor-to-floor time from 34 minutes to 1¼ minutes on blanking ¼" C1010 Steel with a 202" cutting edge. By punching 130 holes per stroke, floor-to-floor time reduced from 36 minutes to 1⅓ minutes.

Talk with our Application Engineering Department about applying a time-cutting Cincinnati Press Brake in your shop. It can be the most profitable decision you've made this year. Write Department A for Press Brake Catalog.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.



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BUTTERFIELD
100%
INSPECTED
TOOLS

the complete line

You name it — Butterfield has everything you want in cutting tools — and can get them to you fast wherever you want them. Taps, dies, counterbores, cutters, drills, reamers, end mills, hobs and carbide tools. Warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York and San Francisco. **See your Butterfield Distributor.**

BUTTERFIELD

BUTTERFIELD DIVISION, UNION TWIST DRILL COMPANY, DERBY LINE, VERMONT

CIRCLE 230 READER SERVICE CARD

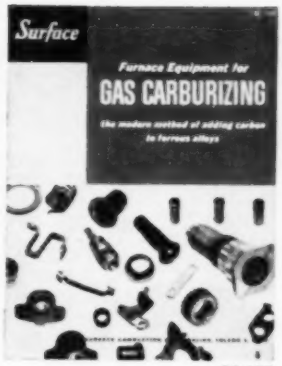
CIRCLE 231 READER SERVICE CARD ►

SC-181

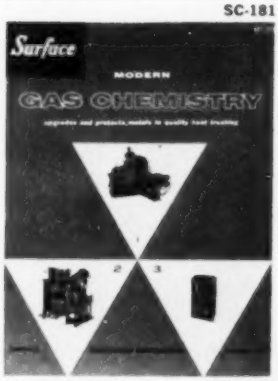
WHAT'S NEW

IN HEAT TREATING?

this library of technical information is yours for the asking



SC-172



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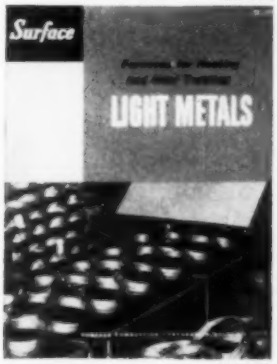

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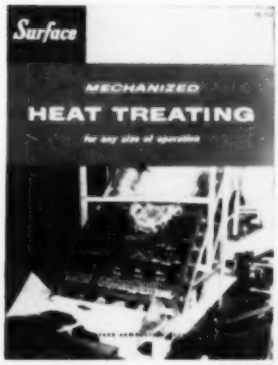

SC-176

SC-174

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SC-177

SURFACE COMBUSTION CORPORATION

2365 Dorr Street, Toledo 1, Ohio

Surface

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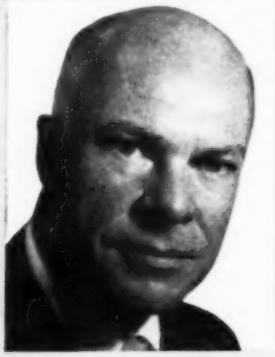
name & title .....

company .....

street .....

city ..... zone ..... state .....

Peter Schladermundt, A.I.A., A.S.I.D., P.D.C., for 25 years a leading designer of many of America's foremost industrial products. Formerly associated with Norman Bel Geddes and other designers and architects on such projects as General Motors "FUTURAMA" and the design of Rockefeller Centre. Presently heading his own firm specializing in all types of design service to industry. Recently designed the Trade Fairs for the United States Government Department of Commerce in Milan and Paris.



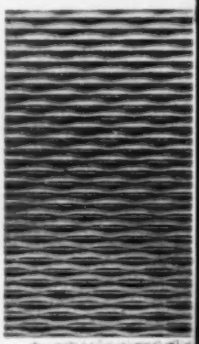
Peter Schladermundt and Sharonart combine for a new design concept...

Tomorrow's business machines will have the low, sleek profile and functional beauty you see in this typewriter design created by the nationally known industrial designer Peter Schladermundt especially for the Sharon Steel Corporation.

Gone is the bothersome cloth cover and in its stead a regular built-in secretarial workshop that includes typewriter accessory and lighted shorthand book and note compartments. And when the day is through the desk area is made neat by simply dropping the attractive machine lid.

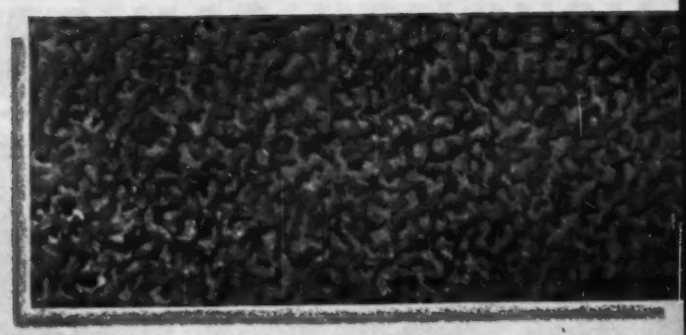
Ingenious? Yes, but perhaps the most important aspect of the design is the functional use of Sharonart, Sharon's popular patterned steel. By fashioning the work areas of Sharonart the usual marks of wear never show, and by forming the cover of this amazing metal many styles are immediately available to the manufacturer by simply changing the pattern . . . and here, too, wear is practically eliminated.

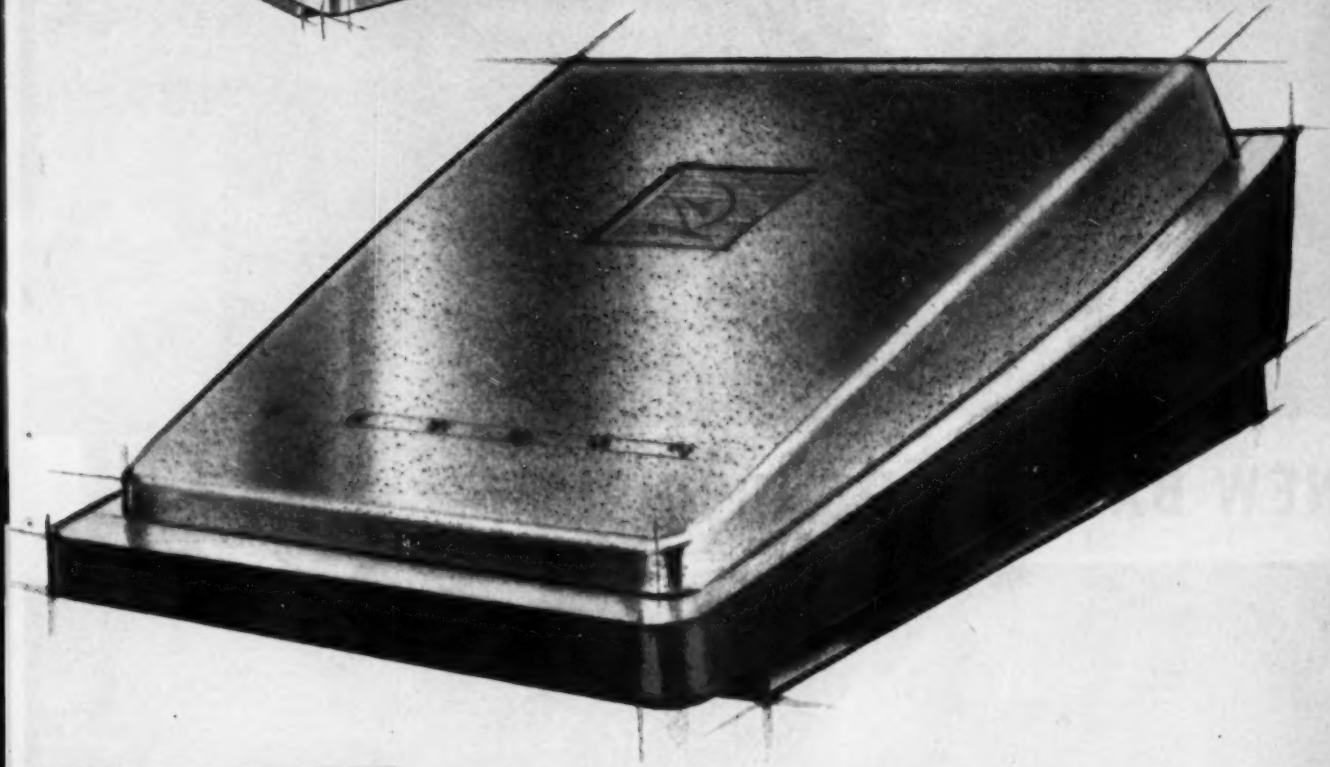
It's the kind of forward thinking that has made Sharonart the most popular material of its kind. Literature and information available from the Sharon salesman in your area or by writing direct to *Sharon Steel Corporation, Sharon Pa.*

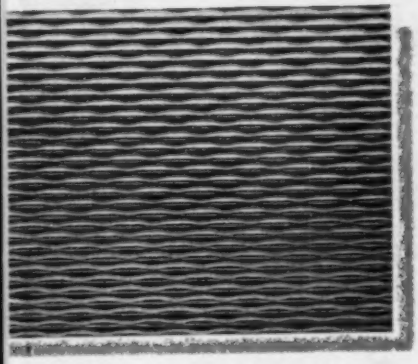


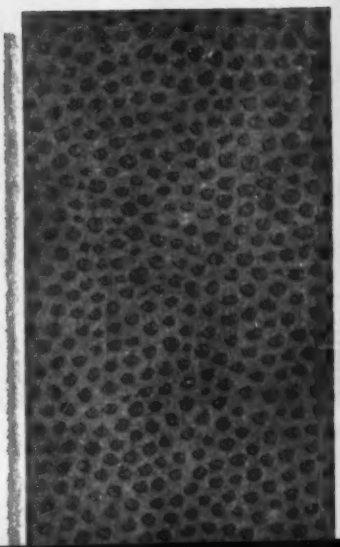
SHARONSTEEL

SHARON *Quality* **STEEL**



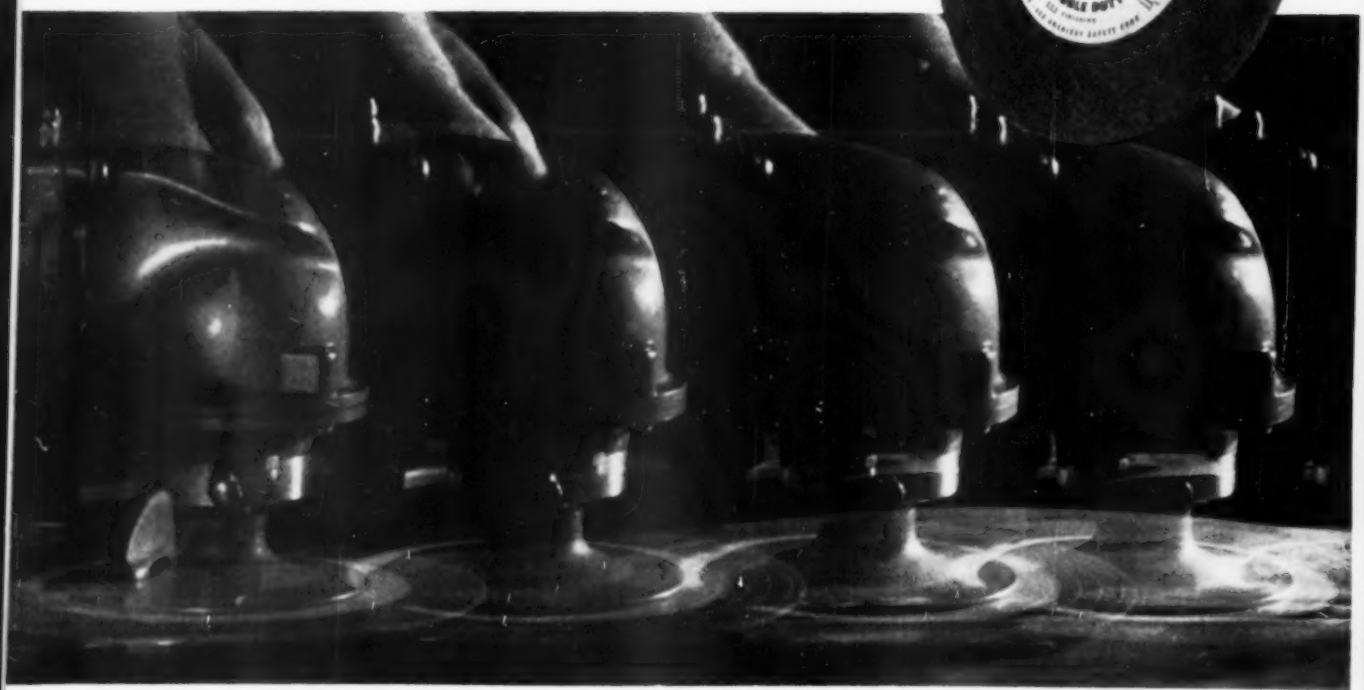






NOW YOU CAN GRIND AND FINISH

NEW BAYFLEX DOUBLE-DUTY



Illustrations above show Bayflex Double-Duty in action, held at correct angle for weld bead grinding (top) and for finishing (bottom)

CIRCLE 234 READER SERVICE CARD

WITHOUT CHANGING WHEELS!

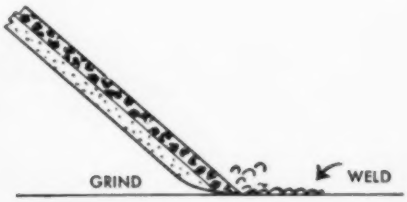
There are two important angles to consider before you buy new weld-grinding or finishing wheels. Bay State's new Bayflex Double-Duty raised hub disc-wheel has them *both!*

The "DD's" unique, two-layer construction gives you two grinding angles: One is 30° - 45° which gives you fast stock removal for grinding weld beads . . . and the other is 10° - 20° which gives you a finish without gouging, a finish so smooth it's just short of a polished surface.

The upper layer for weld grinding comes in a single, standard specification. The lower finishing or blending layer comes in your choice of five different grits (24, 36, 54, 80 and 120) for every type of finishing job from heavy steels through light stainless sheets to aluminum and copper.

Your Bay State representative is ready now to demonstrate the Bayflex Double-Duty in your plant under normal working conditions. Get in touch with him and see what he can do to cut costs and speed up your weld grinding. You'll find he's more than a good salesman . . . because he's an experienced abrasive specialist, too. *Better grinding at lower cost . . . that is his business.*

IS 2 WHEELS IN 1



Upper layer removes stock rapidly when disc is held at 30° - 45° angle.

Lower layer smooths and blends surface when held at 10° - 20° angle.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Mass.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles.
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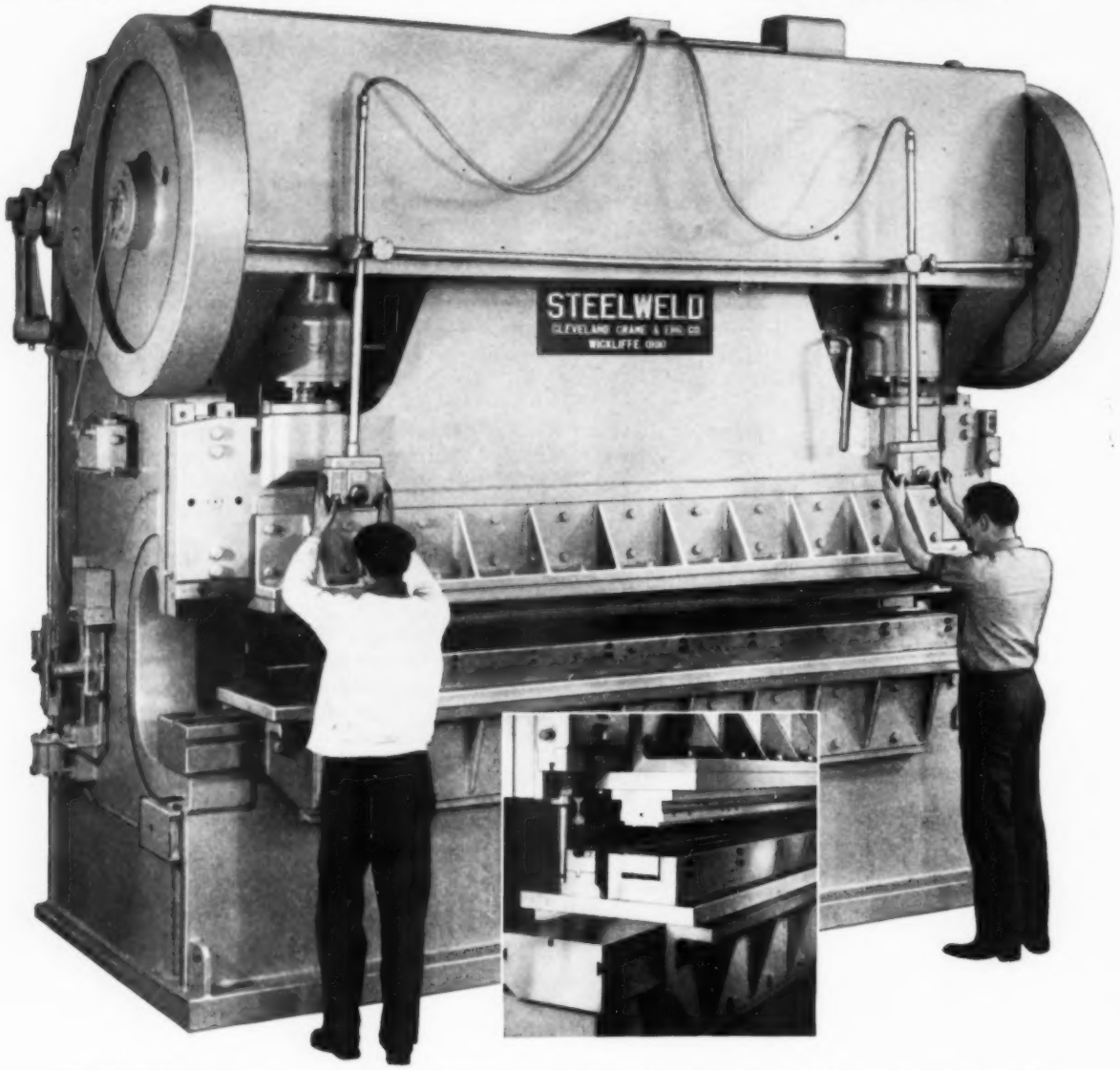
CIRCLE 235 READER SERVICE CARD

STEELWELD PRESS BRAKE CUTS FORMING COSTS

Fast Two-Step Operation Speeds Trolley Duct Production



ELECTRIC trolley duct is turned out at a high rate on a Model K5-10 Steelweld Brake. The machine is fitted with removable bed and ram brackets to provide the width necessary to support two sets of dies. The front dies flange both sides of steel strips. The rear dies form the flanged strips into ducts. Thus, with each stroke of the ram, two operations are performed and a trolley duct completed. As many as 20 ducts can be produced per minute, which is the speed of the machine.

Two men normally work at the press, and each is provided with a set of control buttons. As a safety measure, two "run" buttons, requiring both hands of the two men, must be depressed to operate the machine.

This machine has air-electric control which eliminates the need of any cross shafting at front for mechanical foot treadles. Air-electric control makes push-button operation possible and provides fast, positive clutch and brake action.

Write for free copy of catalog No. 2023A

STEELWELD

Mechanical and Hydraulic

PRESS BRAKES

Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

THE CLEVELAND CRANE & ENGINEERING COMPANY • 1472 EAST 281st STREET • WICKLIFFE, OHIO

Bridgeport Ultra Fine Grain Brass Increases the Beauty and Value of Samsonite Luggage

The striking good looks and incomparable durability of Samsonite luggage make it the most popular "traveling companion" in America. Part of Samsonite's beauty and strength comes from Bridgeport Ultra Fine Grain Brass strip; formed by stamping into the clasps, locks and handle sockets of Samsonite's "Streamlite" selection.

Ultra Fine Grain is exceedingly smooth after bending, forming or drawing and it can be quickly and economically buffed to a high luster at little cost in time and effort. Often, buffing alone is sufficient to meet end-use requirements.

In addition, you are offered specialized technical and engineering aid on any product or production problem that may confront you. Call your nearest Bridgeport Sales Office for immediate service.

Complete and fully descriptive information on Bridgeport Fine Grain Brass can be had in the brochure, "Grain Size, the 4th Dimension of Brass." A request to Dept. 3004 will bring you your copy.

SOLID BRASS HARDWARE
Strong, long lasting Bridgeport Ultra Fine Grain Strip forms these catches for Samsonite Luggage—keeps their natural beauty for the life of the luggage.

Bridgeport BRASS Co.

BRIDGEPORT BRASS COMPANY

Bridgeport 2, Conn. • Sales Offices in Principal Cities

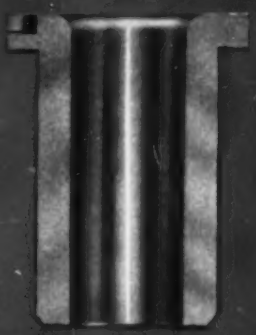
Specialists in Metals from **A***luminum to* **Z***irconium*

CIRCLE 237 READER SERVICE CARD

you get close tolerance drilling with
UNIVERSAL DRILL BUSHINGS

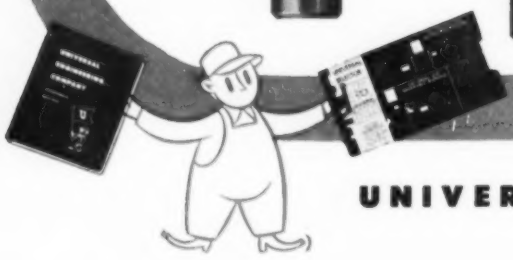
Accurately machined bushings are essential when drilling to close tolerance. UNIVERSAL DRILL BUSHINGS, of finest quality steel, are carefully tested for 100% concentricity and hardness, assuring pin-point accuracy and uniform quality. To prevent tool hang-up and breakage, each bushing has a blended radius on the top inside diameter.

All bores are superfinished. This superfinishing of bushings is important, especially in close tolerance work, because it reduces both tool and bushing wear to a minimum. Knurled head gives a quick, sure grip.



We stock drill bushings in all standard sizes and lengths at each of the following offices—Universal Engineering Sales Co., 1060 Broad St., Newark 2, New Jersey; 5035 Sixth Ave., Kenosha, Wis., and at our home office in Frankenmuth. Contact the nearest office for immediate delivery.

The Universal Drill Bushing Slide Chart gives accurate engineering data for the selection of all types and sizes of drill jig bushings up to $1\frac{3}{4}$" drill size. You may have one—free—by requesting on your company letterhead. At the same time, get your copy of our new catalog that describes all of UNIVERSAL'S products including chucks, tool holders, boring bars, bushings and index plungers.



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1, MICHIGAN

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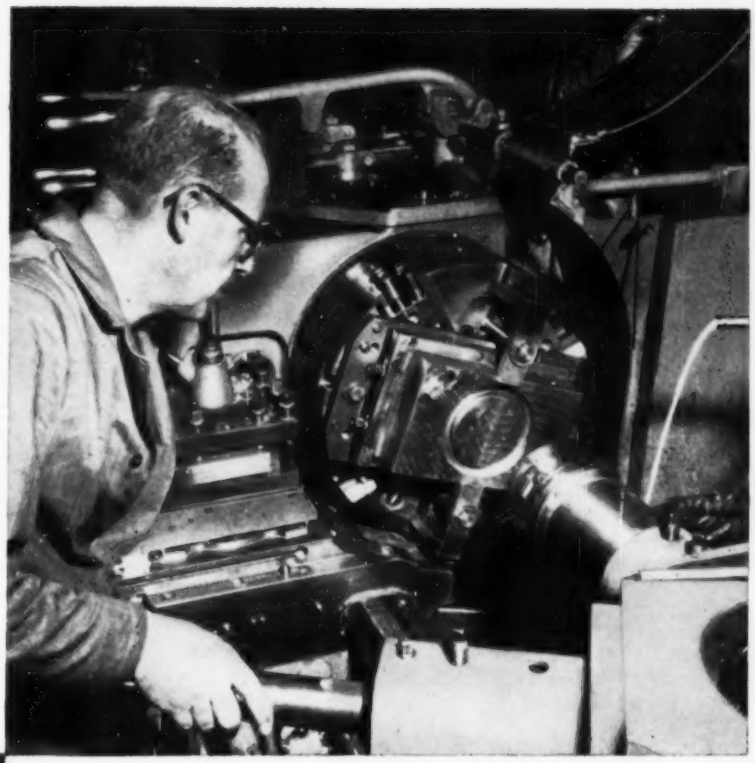
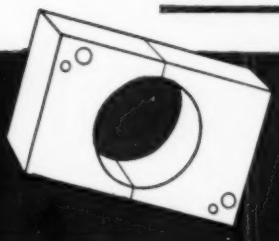
HOW TREPANNING CUT MACHINING TIME 73.9%





Drilling compared with trepanning
Black Rock Shop Order #9278

Old method:	**Min.**
Pilot drill	3
Twist drill	20
Rough bore	25
	48
New method:	
Start groove	9
Trepan	3½
	12½*

*Rough boring not required

Saving—35½ minutes per piece

BLACK ROCK MFG. CO. TRIPLED PRODUCTION WHEN THEY CALLED IN THEIR MADISON MAN

Putting a hole in 4340 forged stock, 3½" deep and 5 13/16" diameter had been taking 48 minutes. This was too slow, rejects were too high.

Black Rock Mfg. Co. of Bridgeport, Conn., producers of Reed Prentice Milling Machines and Lathes as well as rubber cutting and grinding equipment, wondered if trepanning wasn't the answer . . . and called in their Madison Man, the man with the holes in his head.

Based on his recommendations, Black Rock turned to trepanning and produced the same hole in 12½ minutes floor-to-floor. Total tooling costs were less than $500. Production jumped to 5 pieces every 62½ minutes, rejects were cut in half.

Whether it's trepanning, deep-hole drilling, boring, reaming or any hole making or finishing operation . . . your Madison Man has the experience and tools to solve the problem.
CALL YOUR MADISON MAN NOW!

To be sure . . . be sure it's made by . .

MADISON INDUSTRIES, INC.

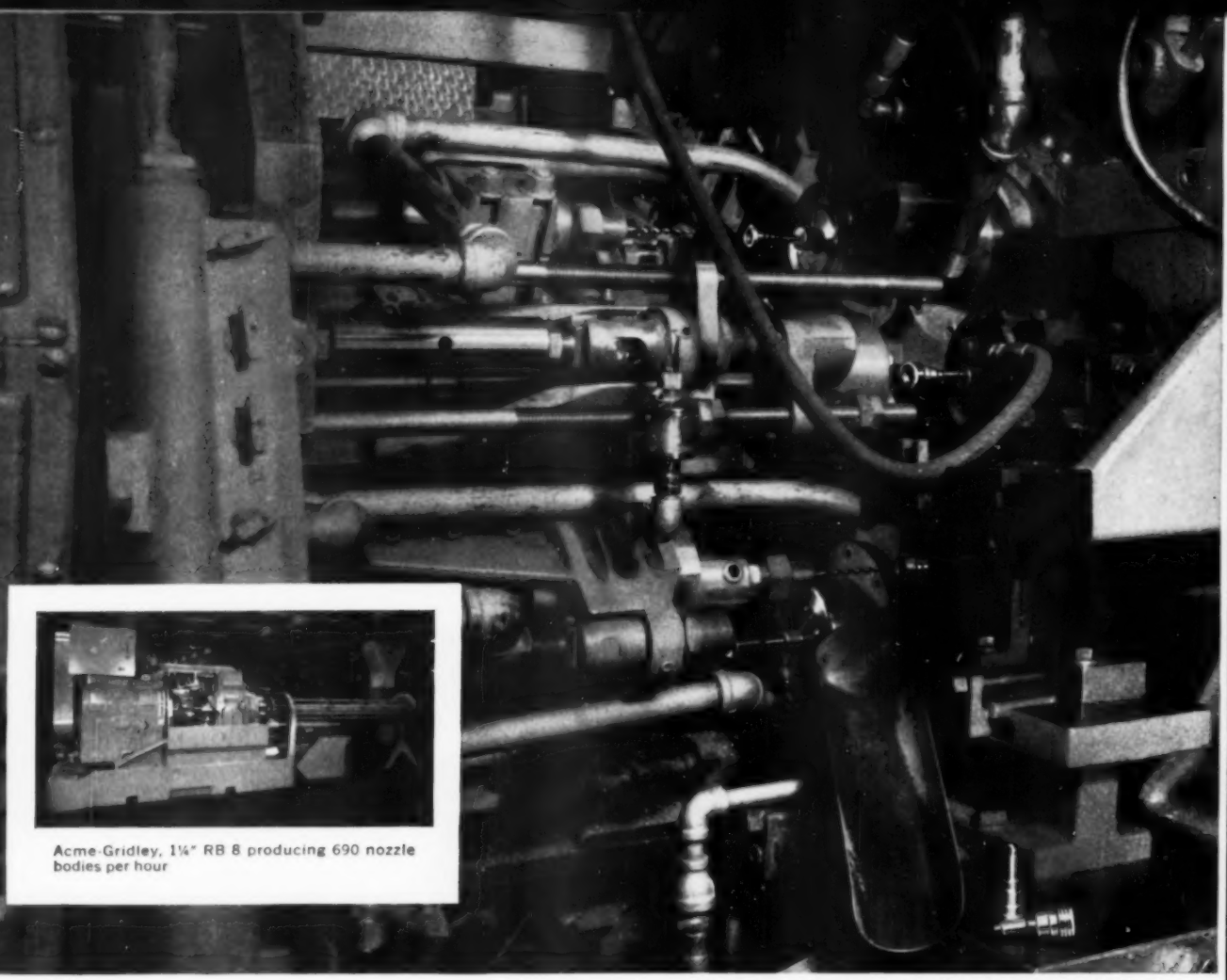
. . . first in inner diameters

DEPT. 203 PROVIDENCE, RHODE ISLAND

Associated with: Madison-Faessler Tool Co. • Madison-Relco Tool Co.

FREE!

Get your Madison Fact File on Trepanning. Please write on company letterhead.



Acme-Gridley, 1¼" RB 8 producing 690 nozzle bodies per hour

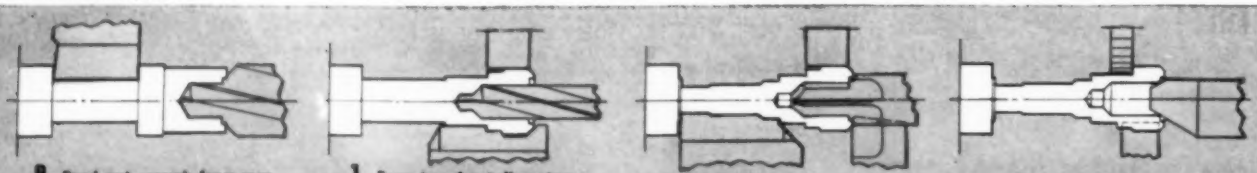
Close-up of tooling zone showing 5th, 6th and 7th positions.

ACME-GRIDLEY ELIMINATES SECONDARY OPERATIONS...

for Eagle Manufacturing Company

- Direct Cost Reduced 48%*
- Production Time Reduced 64%

* Details on request



8. Feed out—rough form rear diameter—counterbore and drill large hole part way

1. Form two front diameters and chamfer head—drill large hole remainder—support

2. Form two rear diameters—ream large hole—face end—support

3. Stop spindle rotation—mill flat—support

As a part of a continuing contribution to all phases of cost reduction, National Acme engineers initiated the development work necessary to effect important savings for this 65 year old Wellsburg, W. Virginia company.

The aluminum nozzle body of their hydraulic pump oilers formerly had been produced on a six spindle automatic and two other machines performing secondary operations. Visionary machine tool engineering made possible the application of spindle stopping and positioning on an eight-spindle Acme-Gridley to complete the entire piece *in the primary set-up . . . and increase net production.*

Advanced design and development such as this, together with wide open tooling zones, independently operated tool slides and the extreme accuracy and flexibility of direct camming . . . makes possible the solution of "unusual" jobs an "every day" occurrence at National Acme.

Write or ask one of our representatives for the complete story on the industry's most modern approach to *your* cost reduction problem.

NATIONAL ACME'S
"ZONE OF RESPONSIBILITY"
INCLUDES ALL PHASES OF COST REDUCTION

Check YOURS...Then Check National Acme

Direct Costs: these include direct dollar savings as realized by the Eagle Manufacturing Company . . . an "every day" job for Acme-Gridleys.

Indirect Costs: effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc.

Product Redesign: teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities.

Direct Material Costs: our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems.

Make-or-Buy Reviews: in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment.

Spot Modernization: pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.

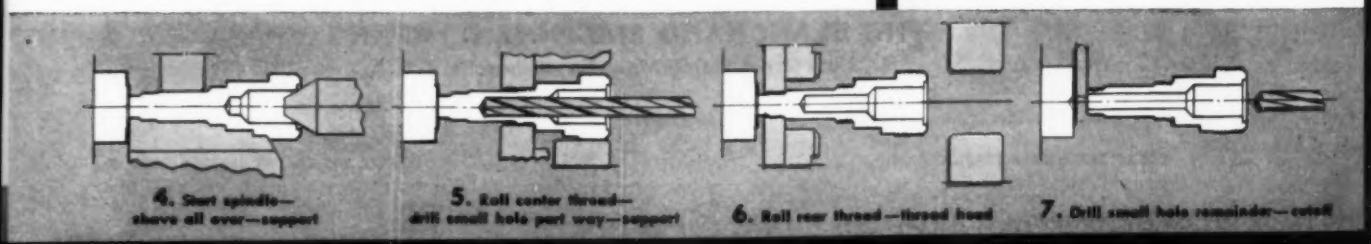
National Acme

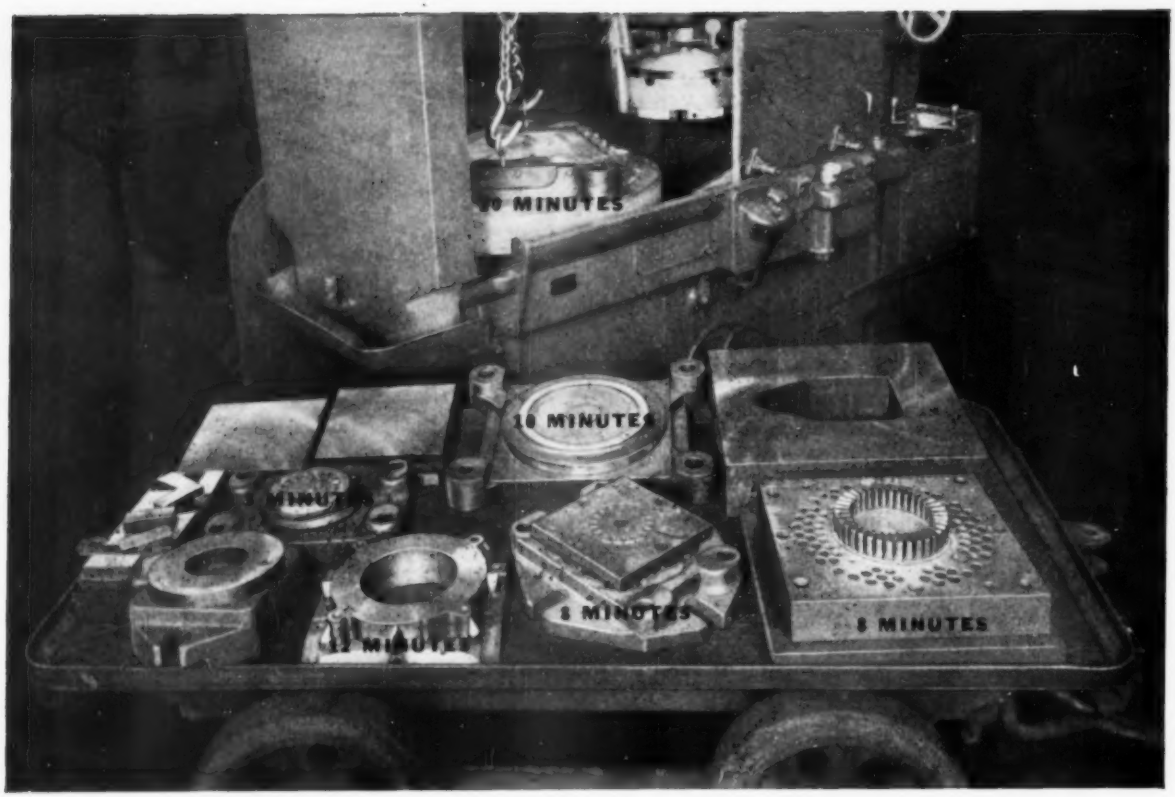
The National Acme Company
171 E. 131st Street
Cleveland 8, Ohio

Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

Pioneer in Circumferential Automation

15 Operations in 5.5 Seconds


4. Start spindle—shave all over—support
5. Roll center thread—drill small hole part way—support
6. Roll rear thread—thread head
7. Drill small hole remainder—cutoff



The *EASIEST, FASTEST and CHEAPEST WAY* TO SHARPEN A DIE is to... *PUT IT ON A BLANCHARD!*

The Blanchard method of die sharpening is unequalled for speed, safety and economy. All of the dies shown are sharpened on a Blanchard No. 18 Surface Grinder with equal ease.

The rotary work motion of the Blanchard, with the wheel covering the entire surface at each revolution, enables the operator to remove the amount of stock to sharpen the die and no more! This saves time and increases the life of the die, too.

The ample supply of coolant and the ability to use free-cutting wheels permit high grinding speeds without danger of burning the work. This extra speed reduces idle time on the presses.

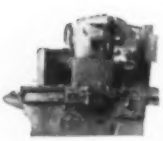
Many shops use their Blanchards for die sharpening as well as all other surface grinding required in their manufacturing. The 3 Blanchards shown below cover work requirements from finishing tiny gears to roughing steel plates 84" across corners.

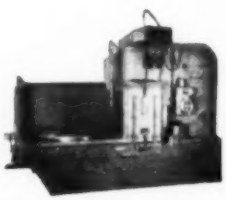
Write today for your free copy of WORK DONE ON THE BLANCHARD, Fifth Edition and "the Art of Grinding", Fourth Edition.

BLANCHARD

THE BLANCHARD MACHINE COMPANY
64 State Street, Cambridge, Massachusetts, U. S. A.

No. 11


No. 18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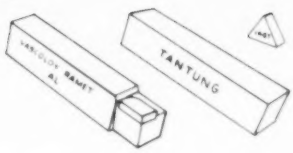
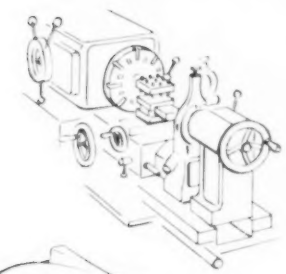
CIRCLE 243 READER SERVICE CARD ►

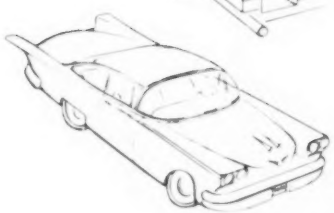
Research...
in metals of tomorrow

V-R

FROM METALS...TO MACHINING...TO FINISHED PRODUCTS







The V-R carbides, Tantung and ceramics you use today are the result of yesterday's V-R research. These special refractory metals are helping industry produce thousands of better finished products at lower cost to provide a higher standard of living for everyone.

Today's V-R research will mean even better metals for better machining on your improved products of tomorrow. That's why V-R research is working full time to produce the metals of tomorrow today.

The vast knowledge acquired through Vascoloy-Ramet Corporation's 29 years of research, design and manufacture of refractory metals is your assurance of continued progress in metals for machining . . . it's our way of helping to increase human productivity and reduce machining costs.

Vascoloy-Ramet Corporation

V-R

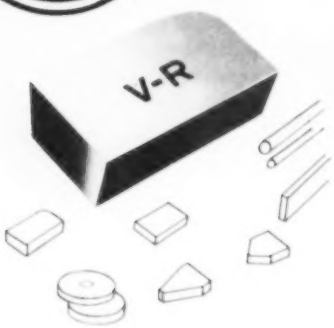
V-R Carbides.....

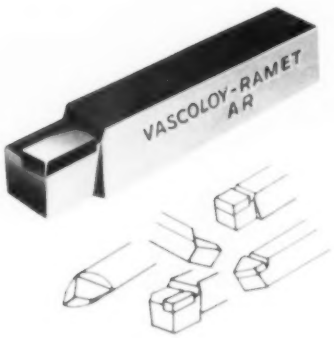
Why doesn't carbide produce equally phenominal results on all applications? The answer is quite simple . . . the carbide required for one job may be entirely different than that required for another job. Best results can be obtained only by engineering the carbide to meet the problems of each type of application.

Here's the point . . . you wouldn't specify 1020 steel for a job requiring a nickel-chrome 3140. Similarly, the proper carbide grade is determined by the specific cutting problem. A vast knowledge of metallurgy and years of experience in refractory metal production techniques enable V-R to build exactly the right combination of characteristics into each carbide grade to do a specific job. These characteristics of the many V-R carbide grades can vary as much as the characteristics of the steel you use.

V-R research has developed carbide grades for maximum cutting efficiency in practically any application and V-R Production Engineers have worked with thousands of cutting problems to fit the right carbide to the job. Put this experience to work solving your problems. Just contact your nearest V-R representative or send us the details of your applications.

V-R BLANKS • BRAZED & SOLID TOOLS • INSERTS





VR CARBIDE BLANKS

A wide range of styles and sizes, available in a variety of carbide grades, means carbide blanks to fit almost any application. Widely used for making tools and parts such as tipped cutting tools, solid tools, reamers, guides, lathe centers, circular saws, instrument parts, bearings, bushings and for thousands of special parts requiring extreme resistance to wear, high temperature and corrosion.

VR CARBIDE TOOLS

Standard tools with brazed carbide tips and solid carbide tools for all types of cutting operations such as turning, facing, chamfering, threading, grooving, boring and milling. V-R also manufactures a wide range of non-standard tools for special operations. Your V-R representative will be glad to work with you to provide you with the right tool for any application.

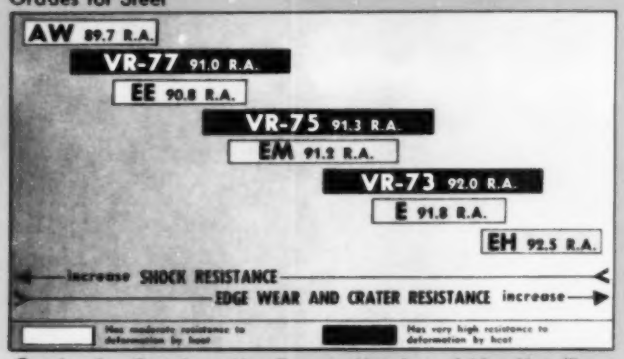
VR CARBIDE INSERTS

Complete line of cemented carbide inserts for operations performed with mechanical toolholders. Includes inserts for both negative and positive rake toolholders; throw-away, 1½" length and heavy duty inserts. Each style is available in a wide range of carbide grades giving you exactly the right combination of insert style and grade to meet the requirements of any job.

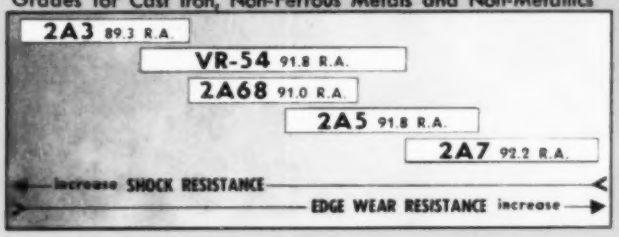
. . engineered for the job!

CARBIDE GRADE SELECTION GUIDE

Grades for Steel


AW 89.7 R.A.
VR-77 91.0 R.A.
EE 90.8 R.A.
VR-75 91.3 R.A.
EM 91.2 R.A.
VR-73 92.0 R.A.
E 91.8 R.A.
EH 92.5 R.A.
Increase SHOCK RESISTANCE
EDGE WEAR AND CRATER RESISTANCE increase
Has moderate resistance to deformation by heat
Has very high resistance to deformation by heat

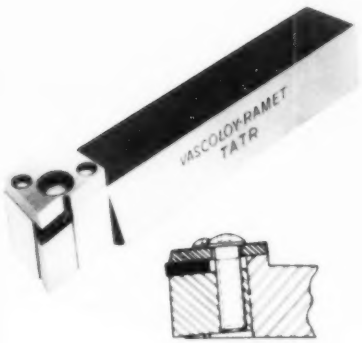
Grades for Cast Iron, Non-Ferrous Metals and Non-Metallics



Carbide Grades

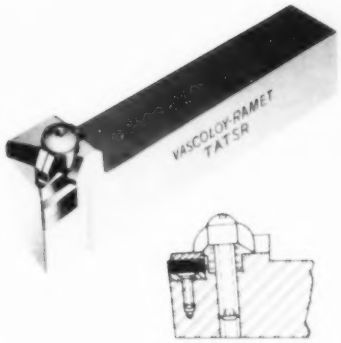
The type of operation performed and the material to be machined dictate the required characteristics of the correct carbide grade for any specific application. These factors will determine the relative importance of shock resistance, heat resistance and edge wear and crater resistance of the carbide. That's why V-R research and production engineers have developed 14 standard carbide grades . . . to provide the right combination of characteristics for practically every application. Other V-R carbide grades have been developed to meet highly specialized applications. Use the handy carbide grade selection guide at the left to determine the proper V-R standard grades for your various jobs. Write for V-R Bulletin No. 5803.

• TOOLHOLDERS • FACE MILL CUTTERS & INSERTS



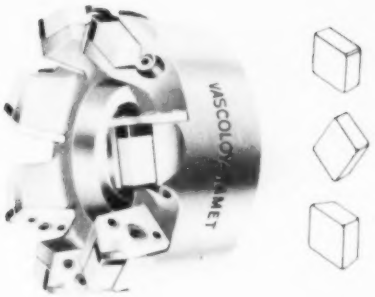
TOOLHOLDERS Elevator Type

Includes all styles of negative rake for throw-away inserts and inserts up to 1½" length . . . positive rake for throw-away inserts. Features amazing simplicity for adjusting, indexing or changing inserts because the insert is clamped between an adjustable elevator and a fixed position chipbreaker plate. No parts to be removed or to fall out even when toolholder is in inverted position.



TOOLHOLDERS Solid Base Type

Complete range of negative rake and positive rake styles for throw-away inserts. Also includes heavy duty negative rake toolholders for turning and facing. A positive-grip screw and clamp arrangement holds the carbide chipbreaker and insert against the solid base. The solid base has a carbide shim which helps minimize damage in case of excessive pressure.



FACE MILL CUTTERS

You change only the carbide insert . . . not the cutter body. Saves downtime, cuts carbide costs and eliminates carbide grinding. Available in negative rake with square insert and 80° diamond inserts and neutral rake with square inserts. Sizes from 4" to 12" diameter for both spindle nose mounting and style "C" arbor mounting.

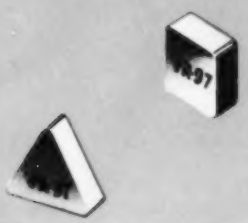
TANTUNG® cast alloy

V-R TANTUNG bridges the gap between maximum cutting speeds of high speed steel and practical minimum speeds of cemented carbides . . . and it's easy to grind with aluminum oxide wheels.

High red-hardness, high transverse rupture strength, low coefficient of friction and high shock resistance are a few of the characteristics which make TANTUNG the ideal tool material for intermediate cutting speeds.

TANTUNG tools are available in a variety of shapes and sizes to cover all types of operations . . . such as turning, facing, chamfering, cut-off, grooving, boring, milling and forming. TANTUNG tools are often used to great advantage in combination with V-R carbides when two or more operations are performed simultaneously at different surface speeds. Ask your V-R representative about TANTUNG cast alloy and how it can cut costs for you in multiple tooling set-ups.

CERAMIC VR-97



CERAMIC VR-97 is an entirely new aluminum oxide cutting material for ultra high speed machining. It's stronger and will outwear any other ceramic because of its high purity and exceptional uniformity. Speeds of 1,000 to 2,000 surface feet per minute or higher are recommended because ceramic VR-97 performs best on continuous cuts at ultra-high speeds. Available in inserts for negative rake toolholders.

MODERN FACILITIES FOR THE BEST IN REFRACTORY METALS

From the modern plant where V-R refractory metals are designed and manufactured . . . to your V-R field service man . . . to your local V-R representative . . . nothing is overlooked to provide you with the service and quality products which help you reduce machining costs. Discuss your cutting problems with the V-R representative in your area. You will soon learn how V-R service to industry can be put to work for you.

• Indicates V-R service men, sales representatives and distributors. Wherever you are located, there's a V-R representative nearby.

Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB.

800 Market Street • Waukegan, Illinois

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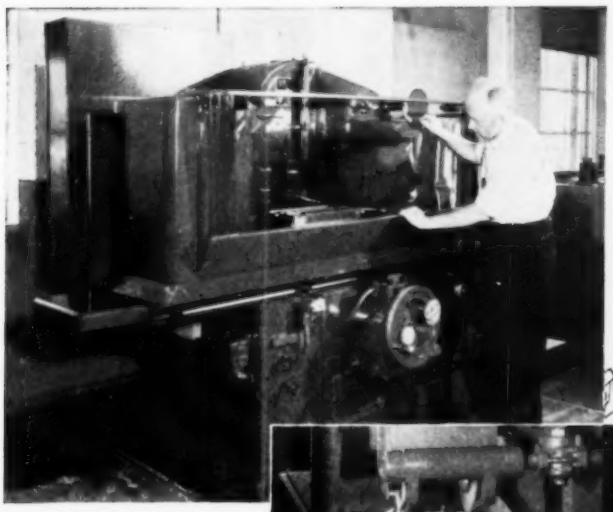
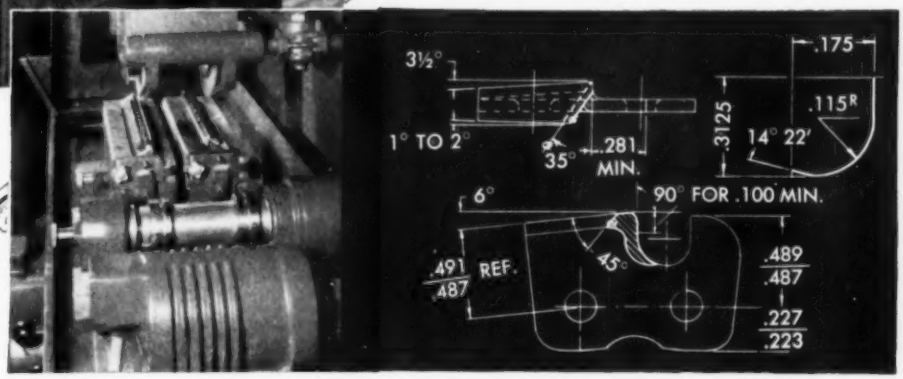
Thompson — TRUFORMING CUTS COSTS 60%





For 140 years, the policy of The Draper Corporation of Hopedale, Mass., has been to offer the highest quality product at the least possible cost.

Following this policy, its subsidiary, BlueJet Corporation, manufacturers of the famous BlueJet saw chain, installed a Thompson Truforming grinder to grind the cutting edges on their chain saw routers. These routers were formerly ground, piece by piece, by a force of 8 employees.

The Thompson Truforming operation is now cutting former grinding costs by 60%. 3 men only are now required for the operation. 40 L.H. and 40 R.H. routers are now ground simultaneously with one pass of the crush formed wheel, resulting in a day's production of over 12,000 pieces—many times that produced by the former method. Both the uniformity and sharpness of the routers have been greatly improved.

For 25 years, Thompson has pioneered and developed the modern advances in crush form grinding. If you have a time-saving, product-improving or cost-cutting problem in your operations, it will pay you to investigate the work Thompson Truforming grinders are now doing in plants all over the country. Our engineering experience is available to you without obligation. Write for Catalog T558.

"Keep Thompson in mind for the daily grind"

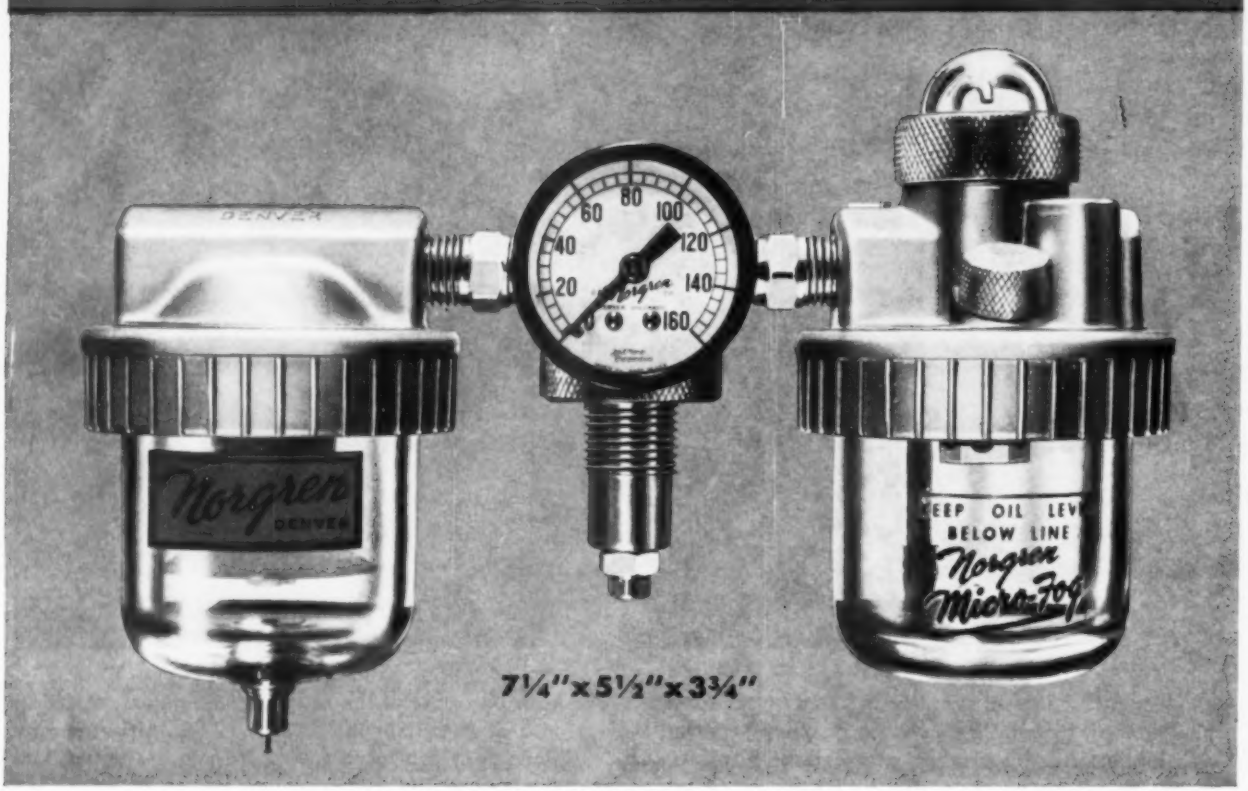
THE THOMPSON GRINDER COMPANY

SPRINGFIELD, OHIO

SURFACE GRINDERS

NEVER BEFORE

HIGHLY EFFICIENT AIR LINE



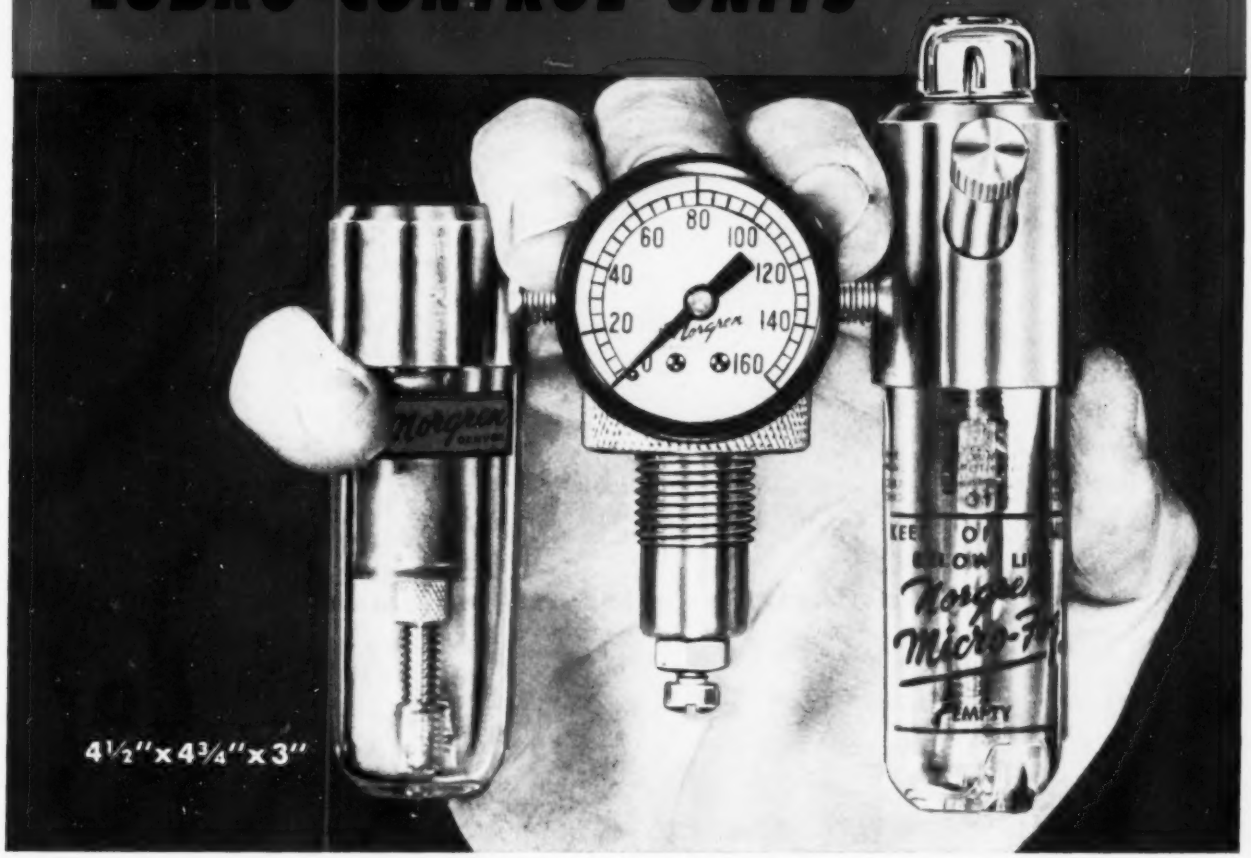
NEW SPACE SAVING

Norgren MICRO-FOG Units

These new Norgren MICRO-FOG units: 1. Provide highly efficient compressed air processing for air tools and other air operated devices. 2. Provide efficient lubrication for bearings and machine tool components. Maximum operating pressure 150 psi, maximum temperature 120° F.

SO COMPACT...

LUBRO-CONTROL UNITS



Models Available for Air Flows from .05 to 20 cfm.

AIR LINE FILTERS

Two new air line filters provide efficient removal of liquids and solids from the air line, preventing damage to connected air equipment.

PRESSURE REGULATOR

A new small, compact pressure regulator is used for both series of Lubro-Control Units. It provides accurate, trouble-free regulation of the air pressure. Adjustable over a pressure range of 5 to 100 psi.

MICRO-FOG LUBRICATORS

New MICRO-FOG Lubricators provide efficient and adjustable lubrication for bearings, air tools, air cylinders and other air operated devices.

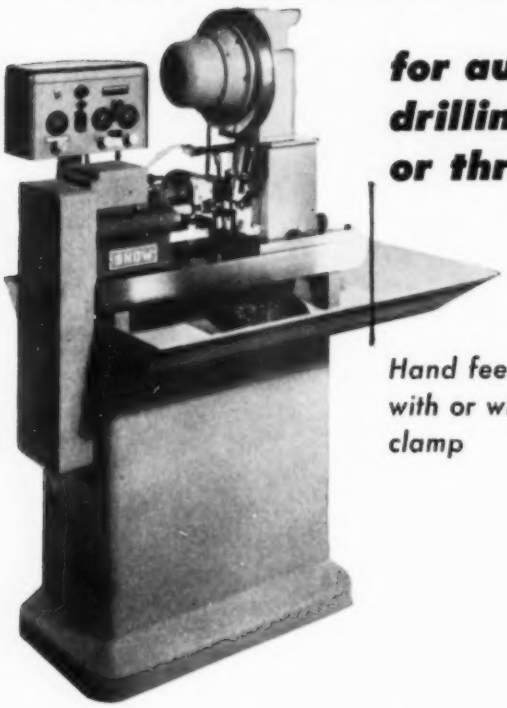
If it's Norgren...It's Dependable.

For complete information, call your nearby Norgren Representative listed in your telephone directory—or WRITE FOR BROCHURE NO. 915B.

C. A. NORGREN CO.

3436 SOUTH ELATI STREET, ENGLEWOOD, COLORADO

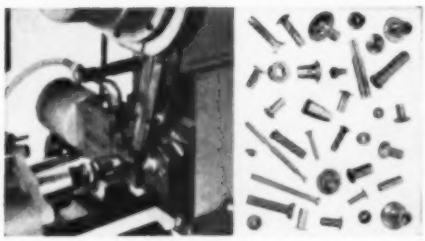
NOW AVAILABLE...



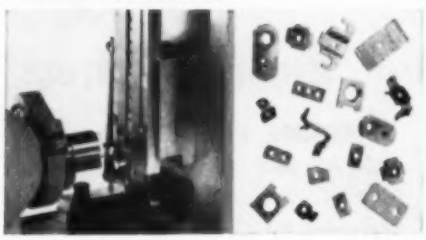
for automatic drilling, tapping or threading

Hand feed or hopper feed with or without air-operated clamp

NOW ...drill rivets faster with minimum tooling costs



Drills 500-3600 per hour; hopper feed; air-operated clamping. Capacity #74 (.0225") to ⅜" in mild steel.



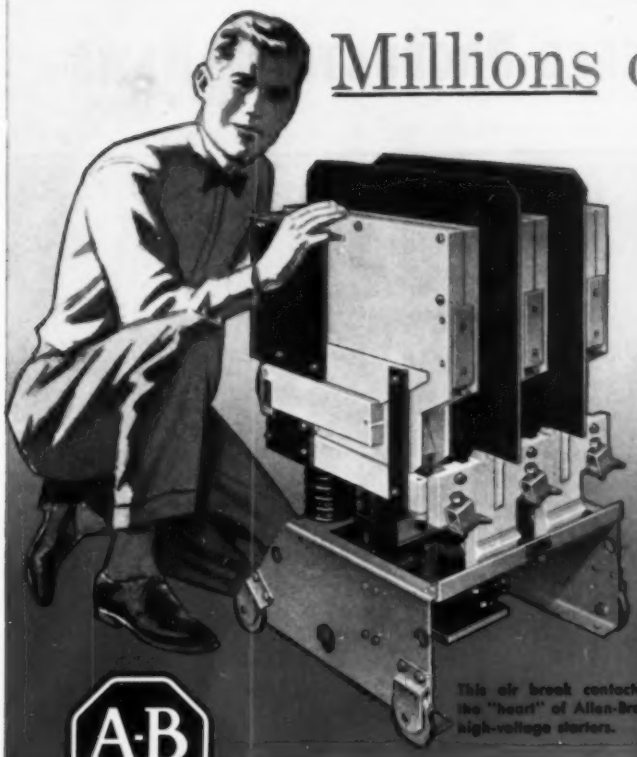
Taps 4000 per hour hand feed magazine. Capacity #0 to ¼" fine pitch in mild steel.

A new horizontal version of the same operating principles long used in Snow vertical machines. Snow machines reduce changeover time, and cut tooling costs to a ridiculous minimum. On your next job, let us show you what the Snow method can do. Submit samples and prints.

Snow Manufacturing Company, Dept. A, 435 Eastern Avenue, Bellwood, Illinois (Suburb of Chicago)

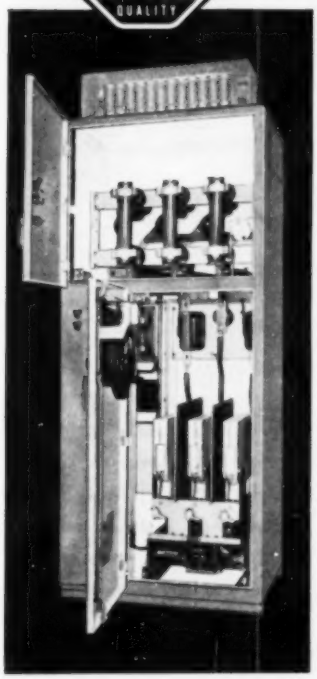
SNOW *master fixtures save dollars and days in tooling costs*

You Can Expect Millions of Trouble Free Operations with Allen-Bradley High-Voltage Air Break Starters



This air break contactor is the "heart" of Allen-Bradley high-voltage starters.

A-B QUALITY

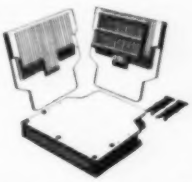


Bulletin 966 high-voltage air break across-the-line synchronous motor starter in NEMA Type 1 enclosure. All A-B high-voltage starters are equipped with current limiting fuses.

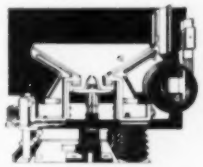
For today's modern plants where tough jobs are the normal routine, there's nothing to match these A-B high-voltage starters. Their simple solenoid contactor—with only ONE moving part—assures an operating life that will *amaze* even the most skeptical. The silver alloy contacts are always in perfect operating condition—no filing or "dressing" is necessary.

These new air break starters are made for all types of motors and for every service—up to 1500 hp, 2300 volts; 2500 hp, 4600 volts. Get the complete story. See how it is possible for these A-B starters to take the punishment of frequent switching, jogging, and plugging. Send for Publication 6080.

Only One Moving Part
Simple solenoid design eliminates trouble-causing pins, pivots, and flexible jumpers.



Faster Arc Suppression
New blowout design and unique arc chute. Chutes are molded from a new arc resistant material.



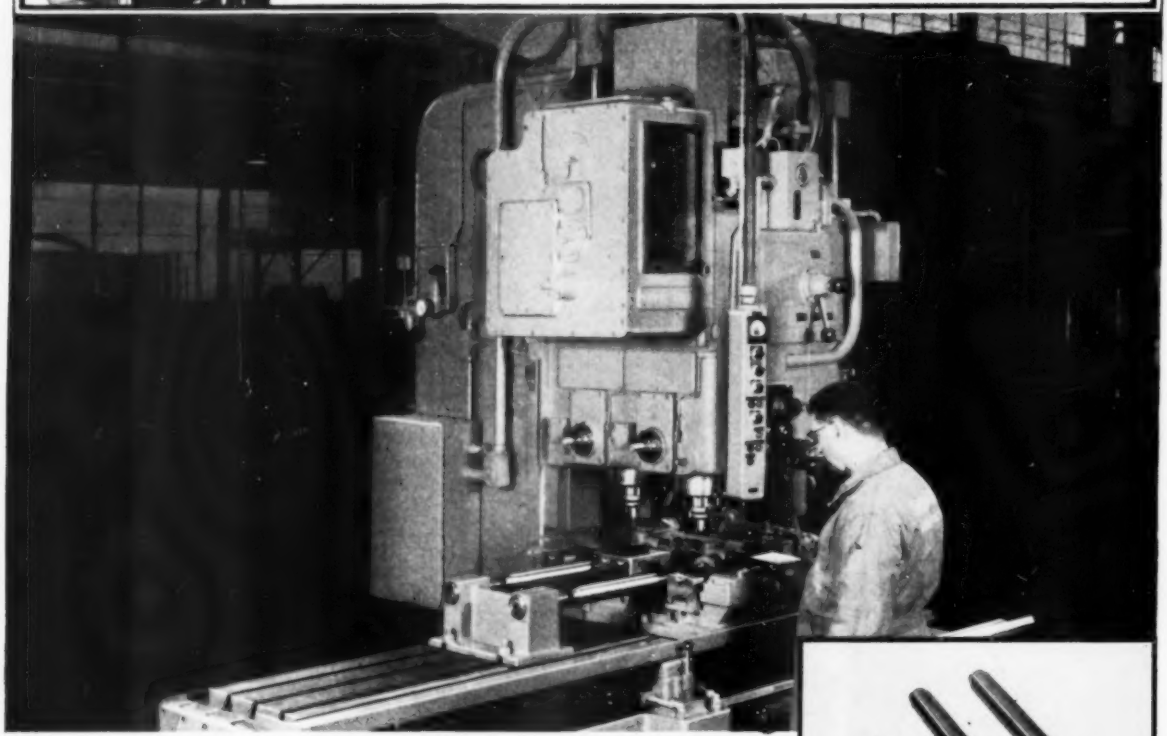
Double Break Contacts
of silver alloy never need maintenance. Vertical motion assures uniform contact pressures.

Allen-Bradley Co., 1310 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

SUNDSTRAND

"ENGINEERED PRODUCTION" NEWS



Keyway Milling Time Cut 30% With Sundstrand Rigidmil

Ability to handle a wide range of parts plus fast changeover are outstanding factors contributing to the production increase on this keyway milling operation. Lot sizes range from 50 to 200 pieces with number of keyways per shaft varying from 1 to 5. In addition to reducing machining time an average of 30%, this Sundstrand two spindle Rigidmil simplifies the problem of maintaining required tolrance and finish.

Table feed is controlled by positive, mechanical infinitely variable feed drive that offers feed rate from 0 to 20 inches per minute and a 300 inches per minute rapid traverse rate. The same type of drive is provided for the spindle with speeds available ranging from 100 to 3000 rpm, using a manual shift lever to select the low, medium, or high speed range. Thus, once the operator selects speed range, he can vary speed infinitely within that range.

Fast, positive milling of up to five keyway depths on one shaft is insured by a turret stop on the head. For intermittent keyway milling, machine is provided with vertical feed.

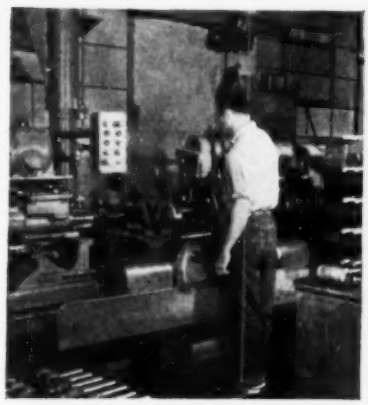
AUTOMATIC LATHES | RIGIDMILS | SPECIAL MACHINES | DRILLING MACHINES | GRINDERS

SUNDSTRAND

Milling and Centering Machine Boosts Crankshaft Output 2½ Times

With Sundstrand's application of "Engineered Production," major savings can be made in preparing work for machining operations to follow. An excellent example is provided in this installation for milling and centering crankshafts for heavy-duty, air-cooled engines.

Production is now at 400 crankshafts per eight hour shift compared with 152, using former methods. Because both ends are finished at the same time, machining time is reduced materially. In addition, because both milling and centering operations are performed in the same setup, accuracy is higher than with other methods. By eliminating the need for a second machine, floor space is saved and capital equipment requirements are reduced as well.



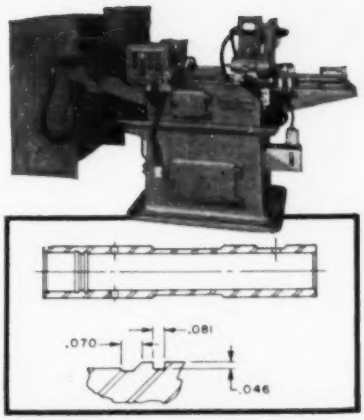
Both cutoff and centering of crankshafts are handled in a single setup on this Sundstrand machine.

Included in the complete line of machines designed for shaft preparation are single end machines for small lot work, double end machines for medium length runs, and broaching and centering machines for jobs where production requirements are high. Automatic loading and unloading can be provided where required for long run production.

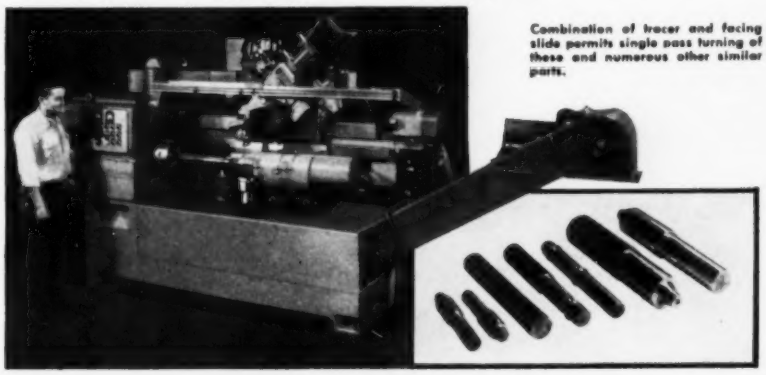
Small Grooves Machined 110 Per Hr. on Thread Miller

Two internal grooves, too small for grinding, are milled and chamfered at 110 pieces per hour on this Hanson-Whitney special 4 x 9 hydraulic machine equipped with automatic loading and unloading. Material is SAE 1062 steel.

Two machines handled by a single operator now do the job that formerly required five machines with an operator for each. All that the operator has to do is load the chute. Workpieces are fed through the spindle, milled and ejected automatically.



Automatic feed and ejection of parts are handled on this Hanson-Whitney thread milling machine.



Combination of tracer and facing slide permits single pass turning of these and numerous other similar parts.

One Lathe Replaces Three

It formerly took three machines to do the job now being handled by one Sundstrand tracer lathe in turning the various sizes of shafts shown in the inset. Parts range in size from 1½ to 6 inches diameter and from 18 to 36 inches long. Frequent changes in the size of parts being machined make the job ideal for the Sundstrand tracer lathe that requires only 10 or 15% the changeover time necessary on other machines. Valuable extra floor space is released and required tolerances readily maintained. The high metal removal rate makes the machine's suitability for automatic chip removal an important feature in maintaining uninterrupted production.

Bulletin 102 describes the broad line of Sundstrand machine tools. Write for your copy today.

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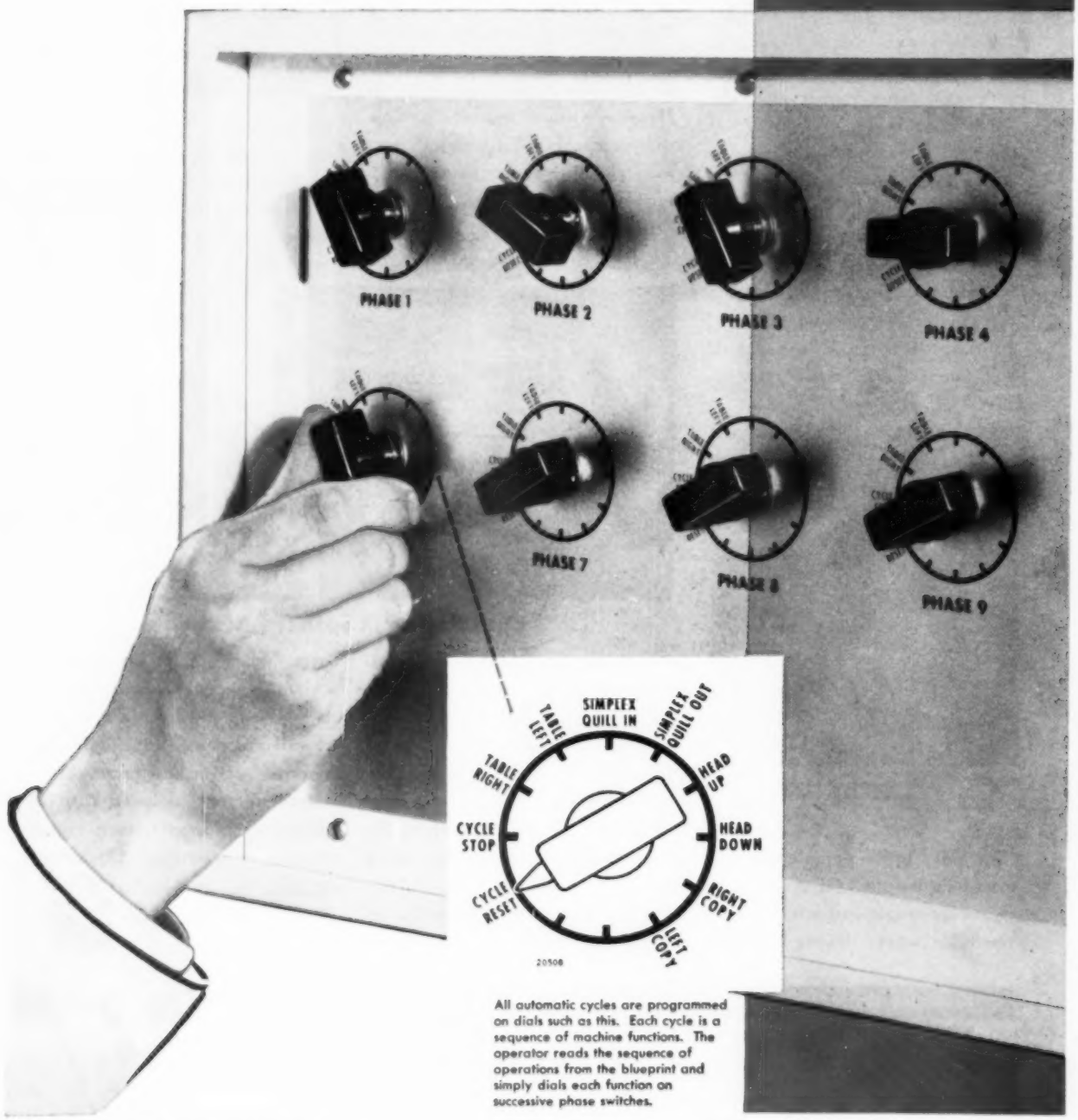
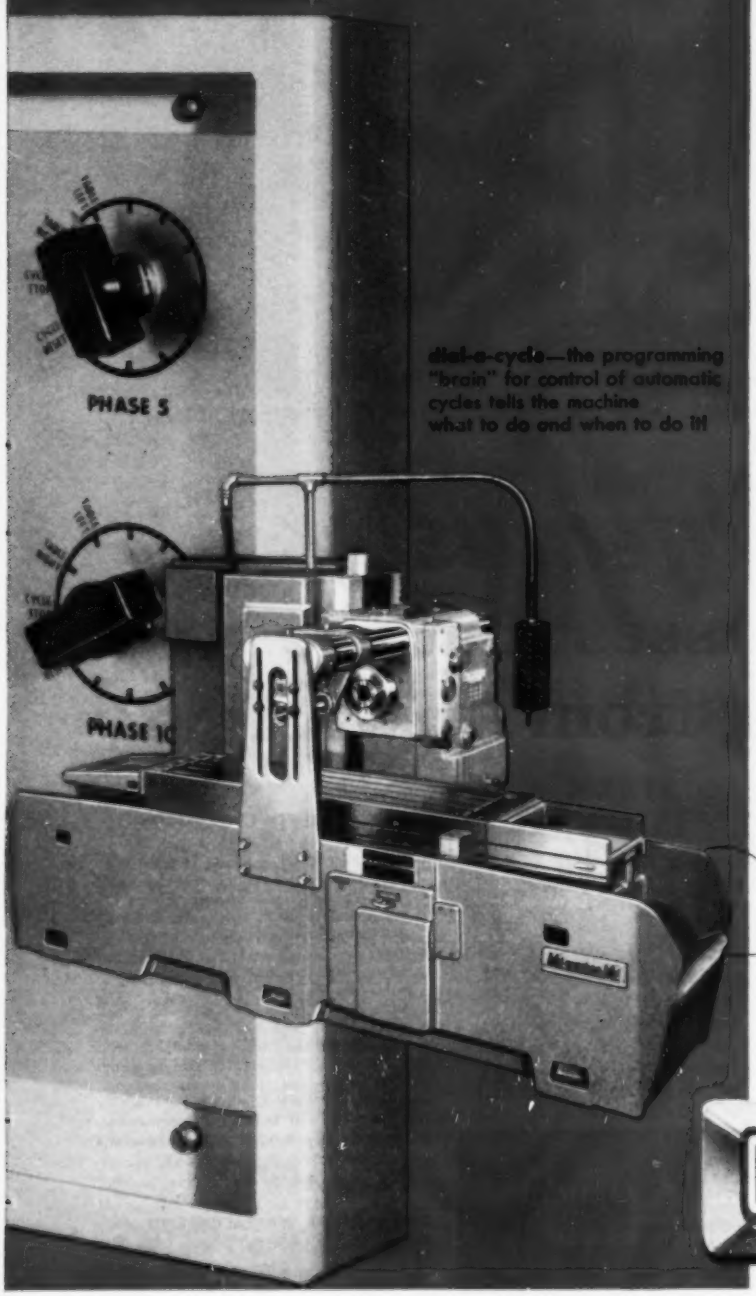


All automatic cycles are programmed on dials such as this. Each cycle is a sequence of machine functions. The operator reads the sequence of operations from the blueprint and simply dials each function on successive phase switches.

Mil·waukee·Mil



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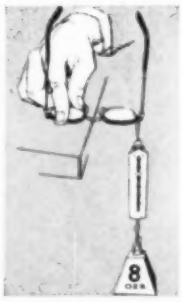

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AGAIN

Revere helps "fit the metal to the job"

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First of all, the breakage of the part was excessively high. Second, the escutcheon which is drawn at an angle, and contains a concave surface on the inside presented a problem in that, after buffing, polishing, and flash plating, the finish produced did not exactly match the chrome-plated bumper.

Revere's Technical Advisory Service suggested these difficulties might be overcome by using Revere 70-30 Brass Strip.

Here, again, by "fitting the metal to the job" Revere's Technical Advisory Service was able to reduce manufacturing costs while improving the quality of the product. Finish of parts was improved while finishing costs were reduced. Finished parts proved an excellent match. Switching to the more ductile metal resulted in less tool wear, while breakage was reduced to less than 1%. All this with little adjustment of existing press equipment.

Why not consult with Revere's Technical Advisory Service and take advantage of its extensive knowledge in "fitting the metal to the job." This Service has saved others money, why not you?

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Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Discussion on drunkenness

Dear Sirs:
I have long been an admirer of your articles in *AM*. However, I don't think you got the whole story in discussing drunkenness checking (*AM*—Dec 15 '58, p87).

The Greenfield device is obviously well designed, but in principle is identical with all the drunkeness checkers on the market. In particular, it shares their most annoying weakness, which is that none can check true drunkenness. The readings obtained always present the sum of drunkenness and eccentricity errors, yet the latter has no effect at all on fit.

Unfortunately, not even the conventional checking on the Universal Measuring Microscope gets around this difficulty.

If you really want to obtain a fuller picture on drunkenness, I suggest you get in touch with Dr J H McLeod at Eastman Kodak. He has spent a lot of time in analyzing this problem, so acute in lens-mounting threads.

I think your article is very timely, because there seems to be a sudden awakening on the practical importance of drunkenness. In the past the problem has often been kicked under the rug, simply because of the great difficulties in making the required measurements.

Dr Erwin G Loewen,
Technical Director,
The Taft-Peirce Manufacturing Co
Woonsocket, RI

Dear Sirs:
Yes, I agree with Dr Loewen that these drunkenness checkers, although very useful, do not give the whole story. I had not realized the objection regarding eccentricity pointed out by Dr Loewen, but I agree with him.

My objection is along another line. I like to make a sharp distinction between tipped threads and drunken threads.

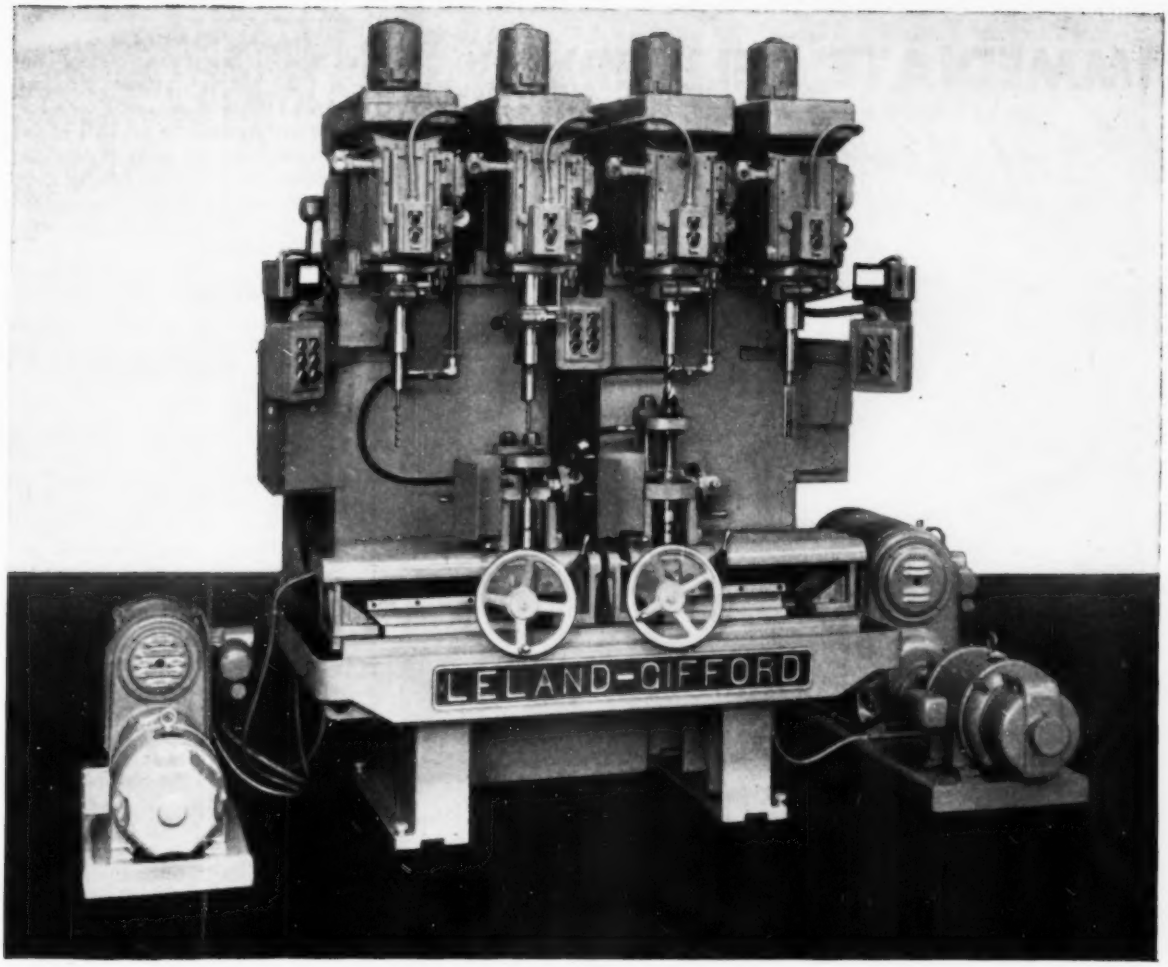
A tipped thread is one that may be perfect within itself but is tipped with respect to the axis on which it happens to be rotating. Any test using centers as reference, as the checkers under discussion do, may throw out good threads.

A drunken thread is something else. Probably the simplest description is to say that the thread is skewed on the cylinder: a

SHOPMATES

N. Jarvis

GENTLEMEN! I'M PROUD!! THE WORLD'S FIRST!! SEMI-AUTOMATIC CHIP CLIPPER.... A PERFECT RUNNING MODEL.... A MACHINE TO GO DOWN IN HISTORY!!
"HM-M-M-M LET'S SEE.... + - ± × ÷ √ A^2 ..... SO SALE - WHOOPS.... HM-M-M-M ACCEN-CHU-ATE THE POSITIVE.... A FEW CHANGES.... MINOR ONES.... FIRST.... TEAR IT ALL DOWN!!
N. JARVIS



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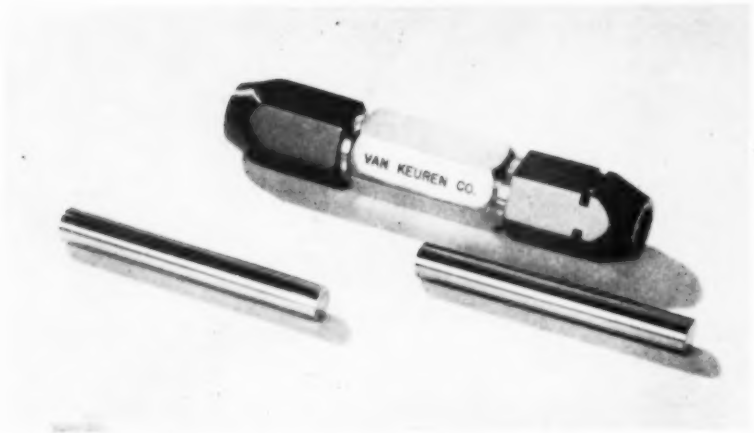

WIRE TYPE (REVERSIBLE) PLUG GAGES were originated by **THE VAN KEUREN CO.** in 1923, and since that time have been supplied to an ever expanding group of manufacturing concerns throughout the country and abroad. The wire type design has enjoyed tremendous popularity because of the inherent economy represented by the fact that the gage units can be reversed, or cut off, to obtain substantial increase in gage life.

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drunken thread is tipped *with respect to its own axis.*

The drunkenness testers described in the article measure thread tilt with respect to centers, not with respect to the axis of the thread itself. In spite of this objection, I believe this type of gage would be very useful, because usually the centers are in line with the thread axis.

J H McLeod
Easman Kodak Co, Rochester, NY

Dear Sirs:
We shall try to answer these questions in order.

In the first place, the principle of this drunken helix checker is not identical with others now on the market. This machine is equipped with an electronic transducer which moves along the axis of the thread being measured.

The machine is so designed that the locating probe in the measuring head can be shifted through a 90° quadrant so that drunkenness errors which do not occur at 180° apart can be detected and measured. This is one of the principal claims of this invention.

In the second place, although it is not shown in the picture in your article, the machine is equipped with a device which permits us to measure eccentricity, ovality, and other errors in pitch diameter irrespective of drunkenness. By measuring both eccentric errors and drunkenness, we can compensate for the eccentricity errors.

The letter states quite correctly that measurement on the Universal Measuring Microscope does not solve this difficulty. It is for this reason that we added the eccentricity checking device.

We feel quite happy that anyone has been enough interested in our device to analyze it to this extent.

Glen H Stimson
Greenfield Tap & Die
Greenfield, Mass

CALENDAR

American Foundrymen's Society—Engineered Castings Show, Apr 13-17, Sherman and Morrison Hotels, Chicago, Ill.

Armour Research Foundation and Institute of Radio Engineers—Conference on Industrial Instrumentation and Control, Apr 14-15, Illinois Institute of Technology, Chicago, Ill.

American Society of Tool Engineers—Annual Meeting, Apr 18-22, Schroeder Hotel, Milwaukee, Wis.

Metal Powder Industries Federation—Annual Meeting and Powder Metallurgy Show, Apr 20-22, Sheraton-Cadillac Hotel, Detroit, Mich.

Metal Treating Institute—Spring Meeting, Apr 23-25, Hollywood Beach Hotel, Hollywood by-the-Sea, Fla.

National Screw Machine Products Association — Annual Meeting, Apr 26-30, Roosevelt Hotel, New York, NY.

Grinding Wheel Institute & Abrasive Grain Association — Semi-Annual Meeting, Apr. 27-29, The Homestead, Hot Springs, Va.

American Society of Mechanical Engineers—Metals Engineering Conference, Apr 29-May 3, Sheraton-Ten Eyck Hotel, Albany, NY.

American Institute of Electrical Engineers — Automatic Techniques Conference, May 11-13, Pick-Congress Hotel, Chicago.

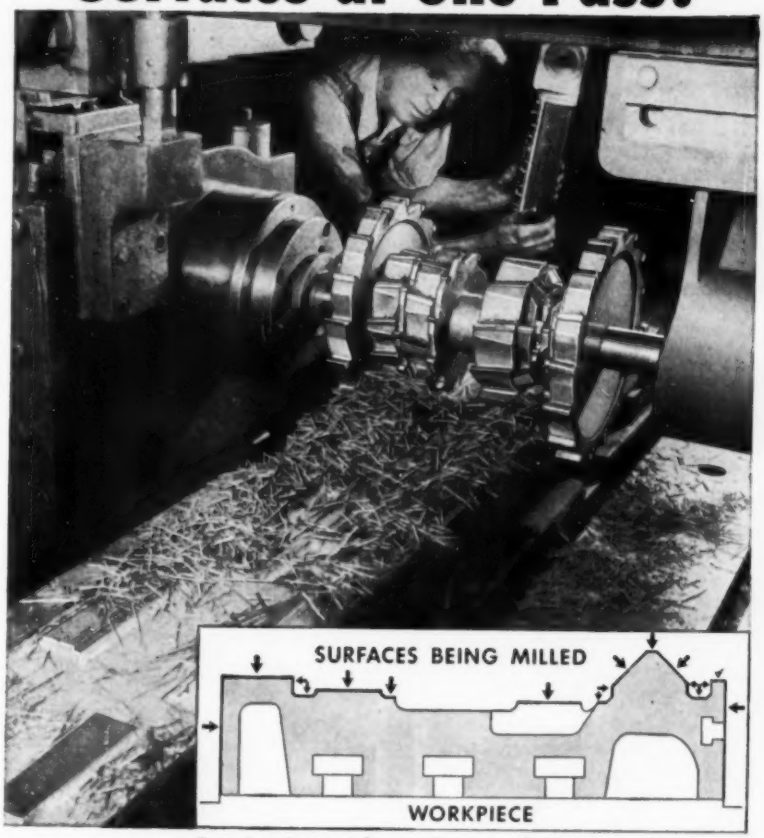
American Society of Mechanical Engineers — Production Engineering Conference, May 12-14, Statler-Hilton Hotel, Detroit, Mich.

Machinery Dealers National Association — Annual Meeting, May 13-15, Plaza Hotel, New York, NY.

American Supply & Machinery Manufacturers Association — Triple Industrial Supply Convention, May 13-15, Dallas.

American Institute of Industrial Engineers—National Conference and Convention, May 14-16, Hotel Biltmore, Atlanta, Ga.

12 Ganged Cutters Mill 17 Grinder Table Surfaces at One Pass!



Does in minutes what a planer used to do in a day—1 pass against multiple passes, 1 set up against multiple set ups.

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high speed, high precision machining of steel

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Extra hard for high speed, high precision machining.

CA 605
For fine finishing and high velocity cuts of steel.

CA 606
For lighter cuts on all steels and magnetic alloys

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For light cuts on all steels; crater resistance.

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General purpose steel cutting; high shock resistance.

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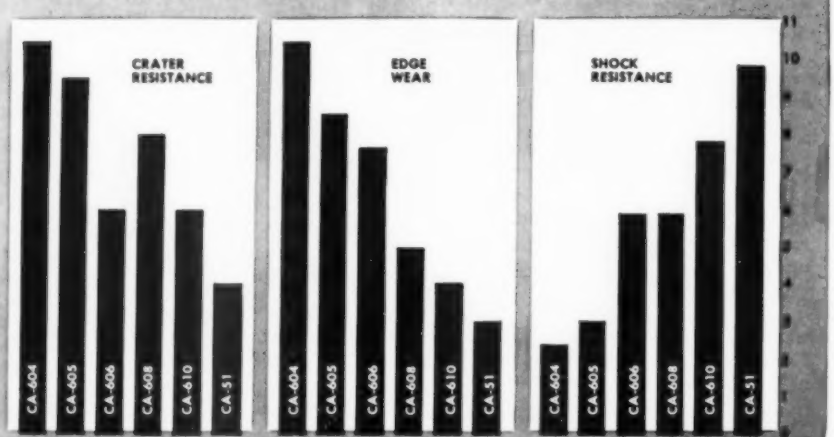
For heavy, interrupted cuts; high shock resistance.

Relative Characteristics of Carmet Metal Cutting Grades

This chart shows how grades in the CA-600 Series compare in crater resistance, edge wear resistance and shock resistance. The units of measurement indicate only relationship between grades, not efficiency.



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CIRCLE 262 READER SERVICE CARD

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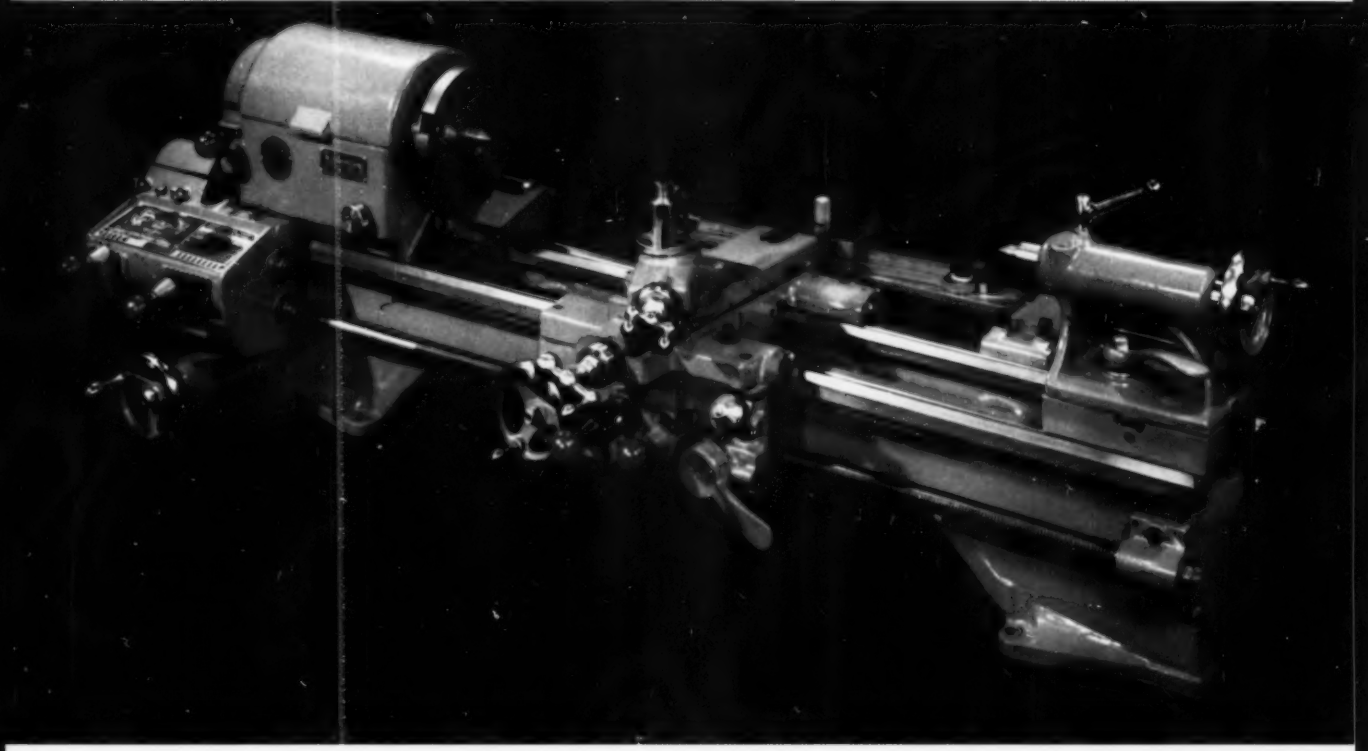
NEW from DELTA



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SPOT NEWS...

- **The Mach 2 B-58 medium-range bomber may soon be converted** into a long-range interceptor plane equipped with air-to-air missiles.

- **More than 70 different kinds of measuring instruments can now be rented** from General Electric Service Shop in Detroit—ranging from a $2500 multi-point temperature recorder (monthly rental $96) down to a pedometer (monthly rental $1). The service is designed for small shops that can't afford to buy such instruments for only occasional use.

- **Recommendations for standardization of components of special machines** have been completed by these machine tool builders: Buhr, Cincinnati Milling, Cross, Ex-Cell-O, Greenlee, Heald, Michigan Special Machines, Natco, Rehnburg-Jacobs, Snyder and Sundstrand. Standards relate to mounting and attaching surfaces, bolt patterns, work heights etc.

- **Russia and her satellites** are now planning inter-nation coordination of machine tool building. Example: East Germany, which has the best design and engineering talent in the Eastern Bloc, will concentrate on building of high-production equipment and automatics, while comparatively backward Poland would confine itself to, say, production of simple lathes. (see p122).

- **Jupiter and Redstone missiles will be produced until 1961,** according to reports from the office of Senator McNamara of Michigan. And that's despite recent layoffs of 2100 at Chrysler's Detroit Ordnance Plant. It's rumored, too, that Chrysler will build the M-60 medium tank.

- **Warehousing is getting to be a problem for heat-treating job shops.** Tendency on part of customers now is to send the heat treater their production requirements for a long period ahead at one time. Then they ask for a ton now, and delivery of the rest at later dates.

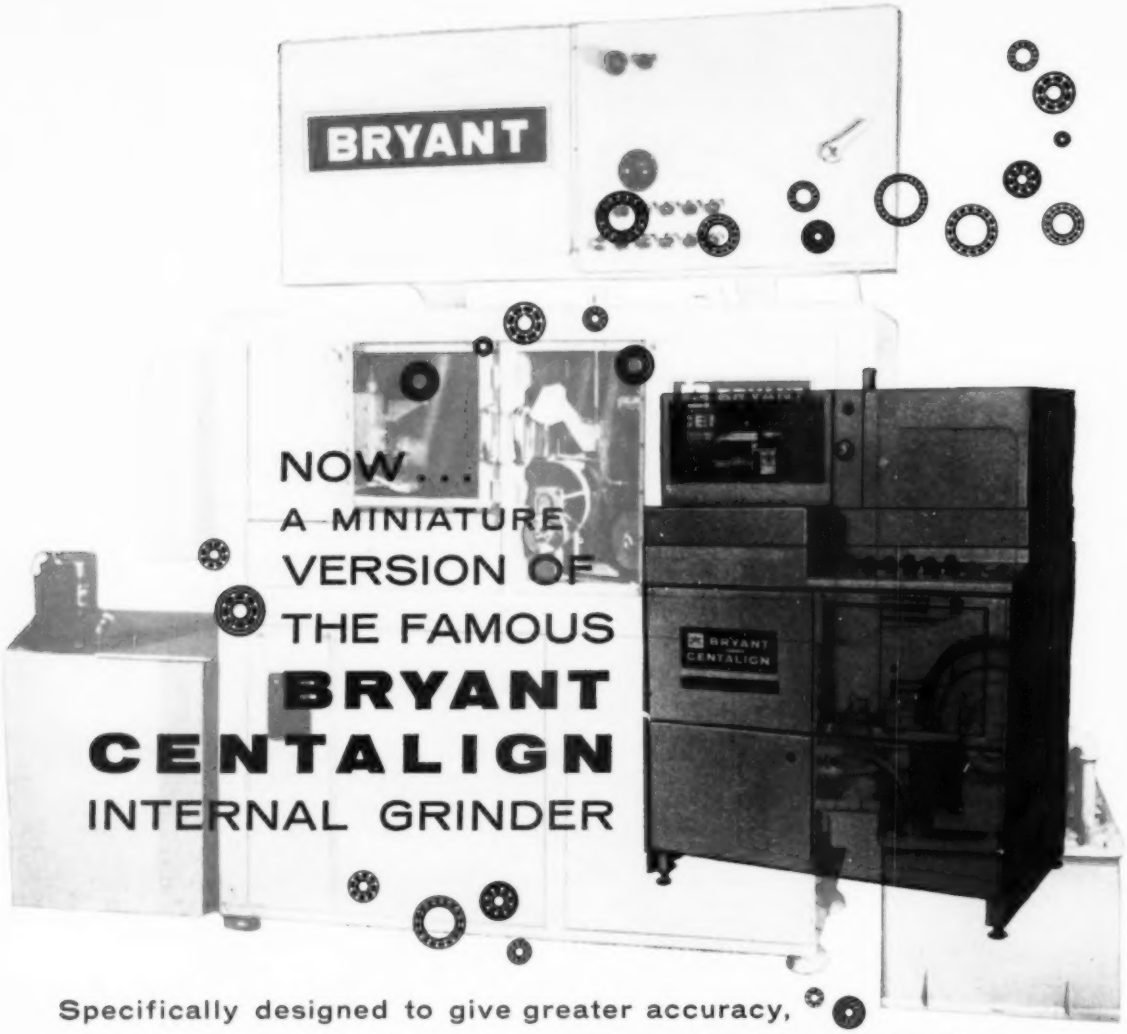
- **First Joint Industry Conference on Hydraulic Standards** for Industrial Equipment (JIC) since 1953 will be held April 15-17 in Detroit's Rackham Memorial. Proposed revisions will cover diagrams, hydraulic controls, pumps; piping, fitting and fluid passages, fluid reservoirs; valves, accessories and devices, and safety.

- **American Motors is switching to lubrication-free nylon bushings** at eight points in the steering linkage of all its V-8 models this spring, will make the change on all its lines with the 1960 models. It's the first positive indication the grease fitting will be extinct in a few years.

- **Reform of defense procurement policies** (the Saltonstall Bill) has bogged down completely because of concerted Pentagon and Congressional opposition. Twin objectives of the bill were to increase use of the weapon system management scheme, and to make it easier for the military to award negotiated contracts. Bill tripped up because it runs contrary to Congress's drive for more formal advertised bidding.

- **"It appears that ceramic structures and materials are well on their way** to replacing metals and metallic alloys as basic materials of construction," in the opinion of Kenneth M Bartlett, president, Horizons Inc, Cleveland research firm. His reasons: they're lighter and have temperature resistance achieved by only a few metals (tantalum, tungsten).

- **For the first time, Soviet autos will be imported into West Germany** this year (900 of them, value $1.07 million, plus $357,000 worth of spare parts). Russia now exports cars to 38 countries.



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WASHINGTON... TRENDS

Capital spending turns up...

American industry plans to spend $32 billion for capital goods this year—and that's 4% more than the 1958 rate of plant and equipment outlays. Even more significant: key manufacturing industries will spend 7% more than they did last year.

Actual spending is going up sharply month by month, to the point where it may outrun predictions by 2 to 3%. These facts and figures come from the Department of Commerce-SEC joint survey.

And they indicate a major upturn ahead in capital goods spending. Such upswings usually last two years, McGraw-Hill's Economics Dept finds. So even though expected capital spending for 1959 isn't up to boom levels (1957 hit a record $37 billion) there's every chance that 1960 and 1961 *will* approach record levels.

Washington experts are relieved by the new report—it marks the first significant boost in plant and equipment spending since the recession dip began in third quarter 1957, and capital spending is the last major component of the national economy to come out of recession doldrums.

Industry spending breakdown...

Hard goods producers plan to spend 7% more for new plant and equipment in 1959 than last year—$5.8 billion worth of outlays compared to $5.5 billion.

At an annual rate, second-quarter expenditures are estimated at $5.7 billion, first-quarter spending at $5.35 billion.

During April-June 1959, outlays by primary iron and steel producers are estimated at an annual rate of $1.2 billion, compared to $980 million in January-March and $900 million in October-December 1958.

Nonferrous metals producers plan to spend at an annual rate of $390 million, compared to $400 million in January-March and $340 million in October-December.

Electrical machinery makers will spend at an annual rate of $510 million, compared to $480 million in January-March and $440 million in October-December.

Other machinery makers are set to spend $950 million at an annual rate in the second quarter, compared to $840 million in January-March and $790 million during October-December.

The estimate for auto makers: $630 million, compared to a January-March rate of $570 million and an October-December rate of $460 million.

Along with the capital outlay increase, manufacturers look for 9% increase in sales over 1958. This would restore manufacturers' sales to 1957's record level. Durable-goods producers alone forecast a 12% rise.

Prices are hot...

The production machinery and equipment industries are right in the political fight now boiling around prices and inflation.

Basically, politicians of both parties are convinced that a political record against inflation is good insurance to have heading into next year's elections.

But the quick flurry on who's responsible for pushing prices up—or not holding them down—was sparked by an analysis of administered prices by economist Gardiner Means. Means showed a series of charts to Congress to back his views that recent inflation has been caused mostly by increases in "administered price" industries—such as steel, autos, metal products, machinery and equipment and others.

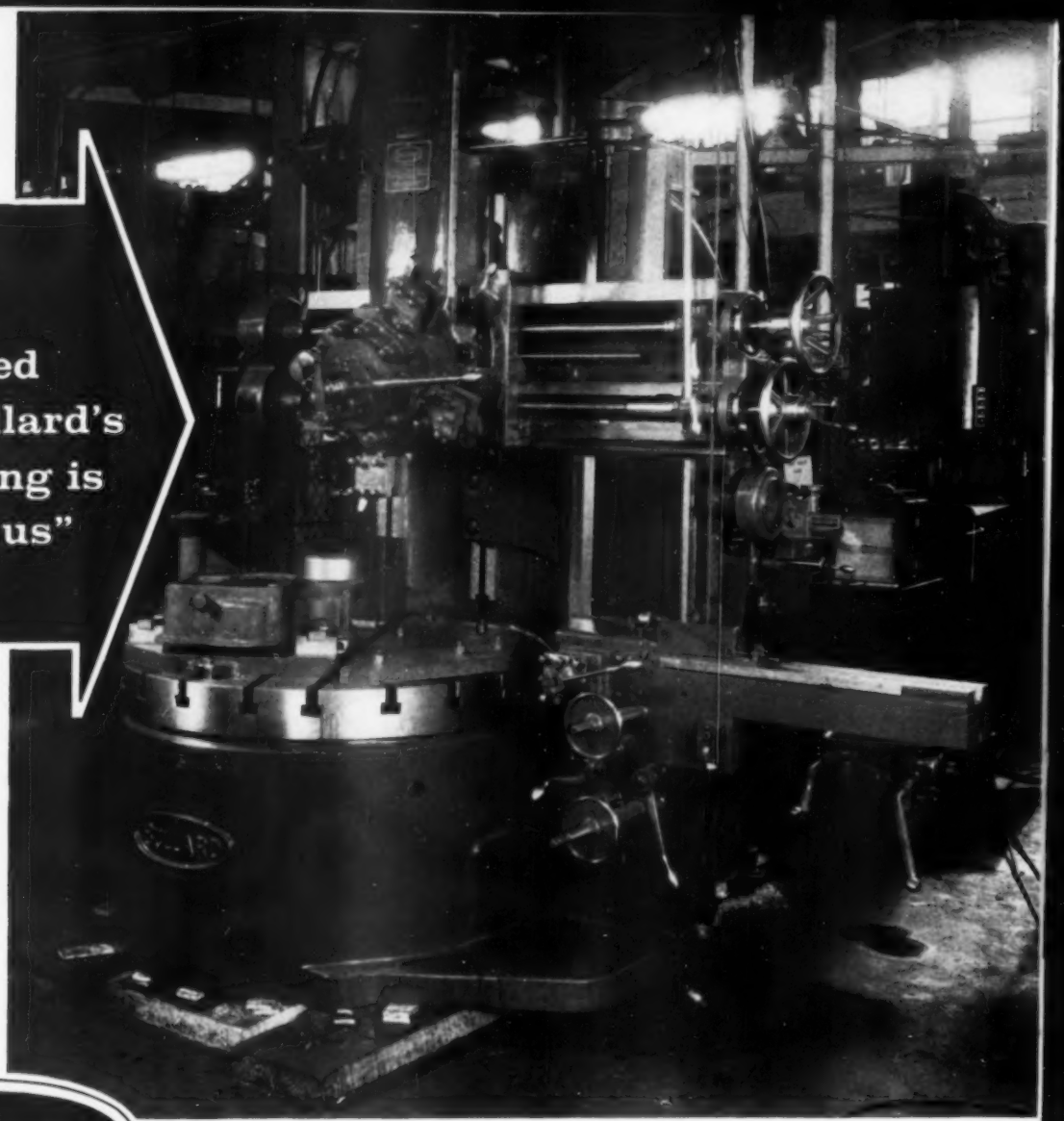
The businessmen who run these industries, it is claimed, have the power to fix prices for their products about where they want them; their prices are relatively inflexible and don't tend to decline even when demand drops off sharply.

Senator Kefauver has been slugging away at administered-price inflation for some two years now without making much of an impression. But Means' charts sparked a discussion among leading Washington economists:

- Woodlief Thomas, conservative economist of the Federal Reserve Board, publicly admitted that the Board can't do much about stemming inflation resulting from administered prices—and administered wages set by big labor unions.
- Raymond Saulnier, chairman of President Eisenhower's Council of Economic Advisers, and Philip Young, head research director at the FRB, agree. Saulnier pinpointed administered industries—specifically mentioning autos and steel—as responsible for reduced output from 1953-57. Young went a step further, saying that these pricing practices were responsible for the 1957-58 recession.

Others jumped into the free-for-all. Senator Kefauver warned steelmakers not to raise prices this summer or face legislative action. Economist John Kenneth Galbraith called for direct government price controls. Rep Reuss (D, Wis) opens hearings this week on a bill he is co-sponsoring with Senator Clark (D, Pa) to investigate wage or price increases that threaten economic stability.

"We're convinced that Bullard's rebuilding is best for us"



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54" Spiral Drive V.T.L. – similar to one rebuilt for Cann & Saul Steel Co.

About a year ago, the Cann & Saul Steel Company, Royersford, Pa., had The Bullard Company rebuild its 54" Spiral Drive V.T.L. Says Mr. Russell Freed, Vice President, "After Bullard disassembled the machine, I visited their plant to check on certain phases of the rebuilding and believe me when they say "Bullard rebuilds from the ground up" they mean exactly that — it was completely disassembled right down to the last bolt. We were so satisfied with their work on this machine that we since have had them rebuild our 42" Spiral Drive V.T.L. — in other words — one good job deserves another."

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DETROIT...

The spring surge . . .

Aristotle and auto sales managers agree that one swallow does not make a spring, so Detroit is cautious in reading too much into a healthy 23% jump in March sales.

The buying urge that once manifested itself by late March and continued through June has been strangely missing since 1955. Yet, with a relatively wieldable inventory of 850,000 units, auto makers are bullish enough to program 400,000 assemblies for April. It's a fingers-crossed proposition. The swallows this year may still have a mental block against Capistrano.

Meanwhile, Pontiac has solidly clinched fifth-best sales position by producing and selling 8900 autos a week. Ford, during the first 10 days of March, averaged 4669 new cars and 869 trucks each selling day, a pace about 58% higher than comparable figures of a year ago. This gives the company 1959 sales leadership over Chevrolet by a substantial margin, according to General Manager J O Wright.

Rambler's continued boom cannot be compared with the industry as a whole. The company now accounts for about 32% of the so-called economy market single-handedly. Studebaker's Lark follows at 14%. Current line-up of imports, following in order, are Volkswagen, Renault, English Ford, Fiat and Simca. Opel, now in eighth place, has upped shipments to 3000 cars per month. If these are sold, as they ultimately will be, the Marque will supplant Simca's position.

Churchill's black-ink Larks . . .

107-year-old Studebaker has repeated the miracle of 1933-36 by emerging once again from a morass of red ink. Operating profits for the final quarter of 1958, coinciding with the introduction of the Lark, were nearly $4 million. Though figures are not final, early 1959 returns show a first quarter net up at least 50% above that figure.

S-P's comeback stemmed from what one might call a Johnny-Come-Lately realization that no one but GM and Ford can afford the luxury of a full-line of cars. American Motors acted on this truism some years ago. Harold Churchill, 55-year-old engineer who came to Studebaker 30 years ago on a temporary assignment and stayed to invent the overdrive, develop the famous war-time "Weasel" amphibious vehicle, and then become president, wasn't ashamed to be second with what seemed to be right. His reward is presiding over a current 53-hour work week at the South Bend assembly plants. Every hour worked from here on in is one more than was worked last year.

The American sports car . . .

There is only one, according to the buffs, and that is Chevrolet's Corvette. Even more durable than its plastic, two-seated hull is the persistent rumor of a switch to steel.

An engineer close to the program said that in 1958 approximately 9100 Corvettes were built. This year, the schedule is running a little ahead. Such a schedule leaves little room for thought of major change in dimension or style.

Performance-minded Chevrolet people — and most of them are from General Manager E N Cole on down—have long nursed the dream of sending a team of Corvettes to Lemans. Each year in France, this famous race sorts out true sports cars from the current crop of scooters. But this year, the supremely authoritative Federation Internationale d'Automobile cut competition engines to a limit of three liters cubic capacity. Chevrolet has no intention of creating such a car just for the 2% of owners who race Corvettes.

Booth's eye view . . .

The well-publicized transition of the Big Three to small cars will not be economic, says Arthur G Booth, peppery elder statesman of international motordom.

Booth, past chairman of Englands' Institution of Mechanical Engineers' Automotive Division, thinks that initial output of these vehicles will be so small that the price difference between them and larger cars won't be large for a long time.

"These new cars may reduce quality," he said in an interview with AMERICAN MACHINIST, when in Detroit for the recent SAE National Automobile Week, "but this will be limited to the refinements that go with a car. You can't cut quality of the body-in-white, regardless of size, nor engine or transmission."

He is sure that nothing will change the popularity of imports on the American market. They sell, he says, because people like them.

As to our standard cars "with their extraordinary front and rear ends," we are, in Booth's opinion, on the wrong track. "Your 300-horsepower ballistic missiles are the main danger on the road today. They are too powerful, large, and covered with details that are not functional . . . And," he added, "I hope that they will continue that way."

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AIRCRAFT and MISSILES...

TRENDS

B-58 project still vulnerable . . .

Although next year's defense budget provides funds to buy 40 more Convair B-58 bombers, the project's future is still insecure. There are some influential Washington officials—either eager budget-cutters or backers of rival projects seeking more funds—who are out to scuttle it.

They tried valiantly while the fiscal 1960 budget was being drafted, and have not given up efforts to trim what they consider a "marginal" project.

In top-level Pentagon councils arguments are still heard that the B-58 should be killed. The claims: The plane has only a "limited stand-off missile capability" and would require "reconfiguration" to handle planned air-to-surface missiles; that the plane's chief virtue is high speed over target—a bomber capability no longer as vital as before.

Other bitter comment on the B-58 centers on the project's over-runs in cost estimates. One Pentagon official claims the Air Force is getting delivery of only 66 planes but is spending money originally intended to build 70 aircraft.

Pentagon scuttlebut has it the project chief protection is that the plane is being built in Texas—the home of Senate Majority Leader Johnson and Rep Mahon, head of the House Defense Appropriations Subcommittee. The state has already been hard hit by defense cuts—Chance Vought's Regulus II missile and F8U-3 naval fighter. Pentagon cynics privately say the administration would think twice before hurting another state defense project.

Convair to design A-plane . . .

Convair has gotten the nod over Lockheed in the Air Force's design study competition for a bomber airframe to be equipped with a nuclear propulsion system.

Convair's selection, however, will not involve a new contract for hardware. The new defense budget provides little if any funds for airframe work. The emphasis is on development of the nuclear engine. So Convair's project will remain at a very limited level of effort.

The Air Force says it will be more economical if a single airframe builder "works directly with the propulsion contractor in carrying out the design from this point on." But Lockheed will still get limited funds to do research on aircraft radiation problems.

A Congressional committee will shortly begin first open hearings ever on the progress made to date on the heretofore hush-hush project. The big question: Why after 12 years and the spending of almost $850 million doesn't the US have a prototype nuclear plane flying now or even a definite target date set for such a flight?

Behind the question are these issues: The administration has decided not to invest more heavily in the program until a nuclear-powered aircraft seems more reasonably certain to perform as an operationally useful plane—specifically, as a supersonic bomber.

Project scientists and engineers, however, held that such a vehicle cannot be developed until the administration is willing to spend considerably more than the present $150-million annual budget set for the program. They want more funds to step up R&D and authority to build a prototype plane, even though it will not approach the operational performance objectives now set for the project.

SF and the Space Age . . .

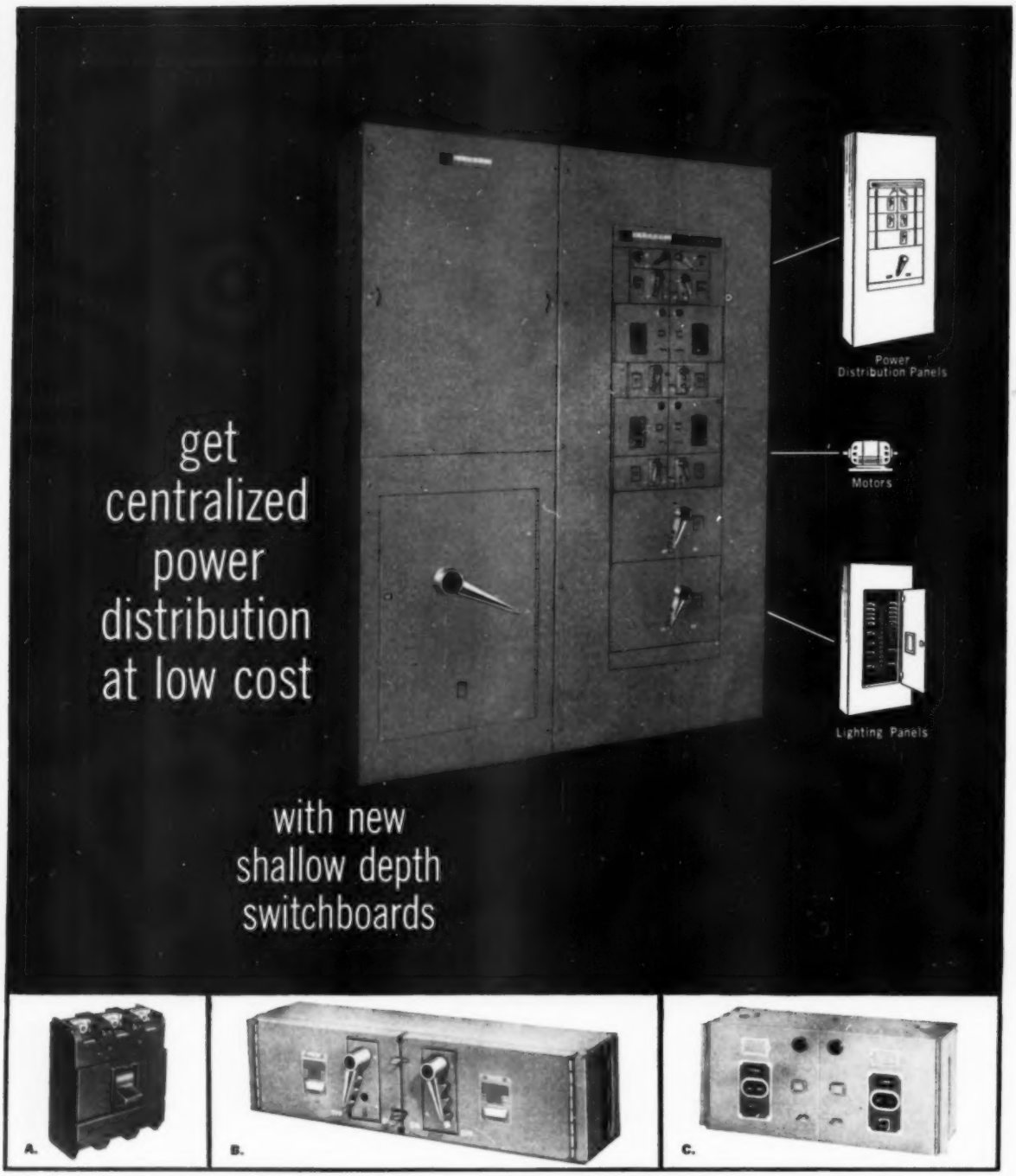
More than 180 San Francisco bankers, businessmen and industrialists met last month to figure out just what effect the government's multi-billion-dollar space program would have on them.

Retired AF General Jimmy Doolittle, now head of Space Technology Laboratories, opened the conference by saying that regardless of the current military aspects of the Ballistic Missile Program, businessmen should look upon it as "the transitional bridge between military and industrial use."

One of the greatest contributions made to management by the Space Program, Doolittle said, is the "concept of currency"—the simultaneous carrying out of chronologically unrelated developments. Under this concept, one team designs, builds and tests a fuel pump while another team strives to develop (within a time limit) the proper fuel to go into the pump.

Management's job is to coordinate metallurgical, chemical, physical and electronic projects with an aim toward a finished missile. This may be expensive, said Doolittle, but it enabled the Thor to ride into outer space in just three years.

San Francisco area firms reported on the current impact of missile and space programs. A Lockheed representative, for example, said that his company's payroll in the area is more than $1.5 million a week, with accounts payable averaging more than $5 million a week. Lockheed deals with 1110 San Francisco area vendors, buys $20 million worth of goods locally a year.



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A. TYPE AB CIRCUIT BREAKERS from 15 through 800 amps. Compact... positive protection... quick-make, quick-break operation... thermal-magnetic trip.

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MACHINE TOOLS...

Detroit placing some business . . .

More interest centers in Detroit than anywhere else. Detroit Transmission Division of General Motors is reported to have placed orders for at least $10 million of the machines needed for its new transmission programs. The bulk of the business is yet to be placed. Two or three transmissions are involved in the programs, which are for 1961 models.

Coming up soon at Detroit is the tooling for so-called compact cars to be introduced for 1961. The compact cars are not the small cars that the Big Three are getting ready. Instead they are more compact versions of the regular-size cars.

Pontiac and Buick are reported to have tooling for compact models under consideration.

Some final rush orders for machines for 1960 models have come into builders lately.

In all the talk about small cars, one report has it that a prominent auto maker plans to import the engine for a small car from Brazil, where production costs are low, and assemble the car in the Detroit area, with the body and other components fabricated nearby.

Fiat to order machines . . .

Fiat is seeking new machine tools for a plant in Brazil. It is asking for terms along these lines: no payments during the first three years; beginning with the fourth year one-eighth of the cost of the machines are to be paid every six months. Interest is not to exceed 8% (European interest rates are usually higher than US rates.)

Motch & Merryweather-Heller agree

The Motch & Merryweather Machinery Co, Cleveland, has announced that its Manufacturing Division has entered into a manufacturing agreement with Heller Gebr GmbH of Germany.

Motch & Merryweather and Heller make many like machines so that the new arrangement, which will provide for the interchange of engineering data and technical information, will materially assist Motch & Merryweather in its research and product development programs.

Heller, one of Europe's largest machine tool companies, has been outstandingly successful in the development of the building block principle of machine tool design.

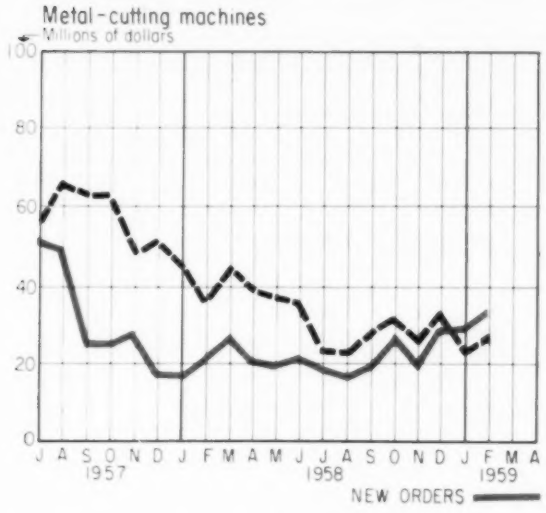
Air Force to study machines . . .

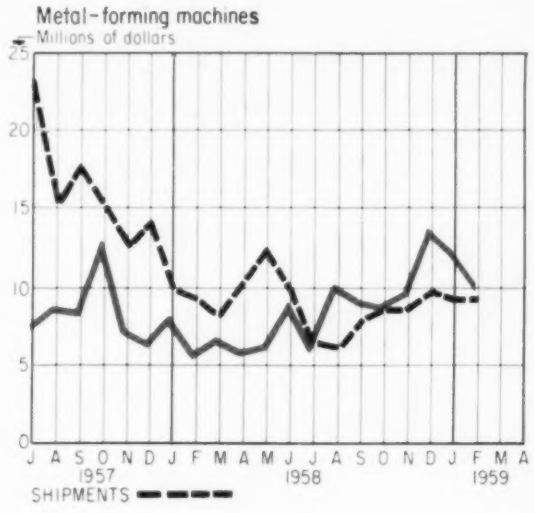
Ralph Cross, executive vice president of the Cross Co, Detroit, is chairman of a modernization study committee to appraise the machine tools now owned by the Air Force. Purpose of the study is to find out to what extent present machine tool holdings meet the needs for modern, low-cost production and what should be done to keep the holdings up-to-date. William Davis of Ford, Elmer Burnett of American Motors and Douglas Lowry of Chrysler are on the committee.

Machine tool bookings rise . . .

Net new orders for cutting-type machine tools in February rose to $36 million from $29 million in January. It was the highest monthly total since August 1957. Though orders for forming-type machines declined to $9.4 million during February, total bookings for both cutting and forming types went up to $45 million, a gain of $4.4 million for the month. What's more, new orders are beginning to exceed shipments. A healthy sign is an increase in business in elephant tools.

BF





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from new Ledloy 170 tubing

This part for an automotive air suspension system was formerly machined at 131 s.f.m. from MT-1015 tubing. New Ledloy® 170 tubing increased machining speed by 24% to 163 s.f.m., giving a superior finish and extended tool life of 25%.

Ledloy 170 tubing is the world's fastest machining steel tubing—and only Ryerson has it available from stock. It's a cold-drawn, seamless product of low carbon analysis with .15% to .35% lead added. Sizes available to date: 1" to 2½" O.D. with maximum ⅜" wall thickness.

Ask your Ryerson representative for complete details on Ledloy 170 tubing —and new Ledloy 375, world's fastest machining bar stock. These two newest additions to Ryerson stocks supplement the already large supply of screw steels and leaded alloys for all applications.

FREE-MACHINING STEELS IN STOCK

Ledloy® steels and screw stock—Ledloy 300 rounds to 4", squares to 1½" and hexes to 3". Ledloy 375 rounds to 1" and hexes to ⅞". Also on hand—all your requirements for C1213, MX1213, and leaded and non-leaded C1117 and C1141.

Carbon steel tubing—All the popular sizes and wall thicknesses used by automatic screw machine shops are ready for shipment, including new Ledloy 170 tubing.

Alloy bars—Complete selection of leaded alloys, including Ryerson Rycut® steels—fastest machining in their carbon ranges.

Stainless bars and tubing—Here, too, our stocks are the nation's largest, including easy-machining Types 303 and 416 in rounds, hexagons and squares.

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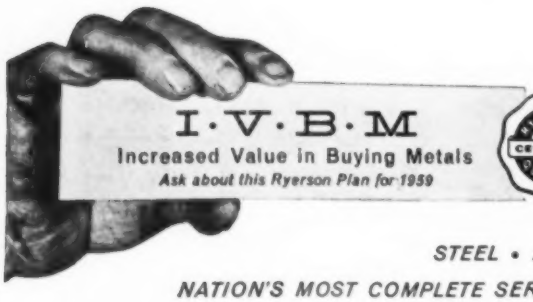

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MATERIALS... TRENDS

New process makes iron...

Reports from Paris say that National Lead Co and Republic Steel Corp contemplate spending $22 million to erect an industrial scale plant in Morocco to treat rif ores by the new R-N Direct Reduction and Beneficiating Process. They have also set up an office in Europe—the R-N Process Agency—to develop the new process there.

Resulting from research in a pilot plant at Birmingham, Alabama, the R-N process is said to treat ores of lower grade than is presently convenient in conventional blast furnaces. Moreover, the usual impurities—phosphorus, silica, and sulfur—do not become active and therefore raise no problems. Furthermore, the process uses a kiln and natural gas is adequate for the combustion process, although a solid carbon reducing agent is still required. The process can operate on coke breeze or lignite rather than expensive metallurgical coke.

Ore is charged into the kiln and heated to about 1900 F. This is some 700 F below the melting point of iron, so the iron is never molten. It emerges from the kiln as a conglomerate which then is crushed. The iron powder is separated magnetically; then briquetted to convenient shapes, usually cylinders. In this form the iron is 90 to 96% pure.

Process costs are said to be 15 to 20% lower than for pig-iron produced in blast furnaces. However, this saving reflects a capital-equipment cost for the R-N process at about half the cost of a blast-furnace complex of comparable size.

A number of changes in industrial structure could flow from this process, if the Moroccan experiment is tried and found successful. For example, the lower limit of size for economic working is considerably smaller than for a blast-furnace complex. It is claimed that a unit to produce 200,000 tons of iron per year can be fully commercial; in some instances even smaller units are practical, depending upon the ore available.

Subject to the availability of fuel—and almost any carbon fuel will do—there is no reason why the equipment cannot be set up near the iron-ore mines. Transportation savings could be sizable. This possibility opens up extensive low-grade ore bodies located in Italy, Great Britain, Luxembourg, Lorraine, etc. The iron, in turn, may well create new centers of metalworking activity. It could also markedly increase the interest in metal-powder fabricating techniques, including extrusion from compacted billets.

Originally developed in Norway 20 years ago by the Titan Company, in which National Lead has an interest, the process was overshadowed by a greater interest in extracting titanium for paint.

Colloidal graphite lubricant...

"Suspension 10" is announced by the Joseph Dixon Crucible Co as the first high quality, high purity, finely stabilized natural colloidal graphite ever produced in the field of solid lubricants. It will pass through an extremely fine wool-felt filter that non-solid additive lubricants fail to penetrate completely.

Developed for high temperature, severe load industrial applications, the new lubricant is called especially practical for glass-mold lubrication; forging (ferrous and non-ferrous) and die casting; forming, stamping and drawing aluminum, titanium, etc; conveyors and chains, and for assembly and run-in of parts. First public demonstration will be at the American Society of Lubrication Engineers' convention in Buffalo, NY.

Coating boosts grinding efficiency...

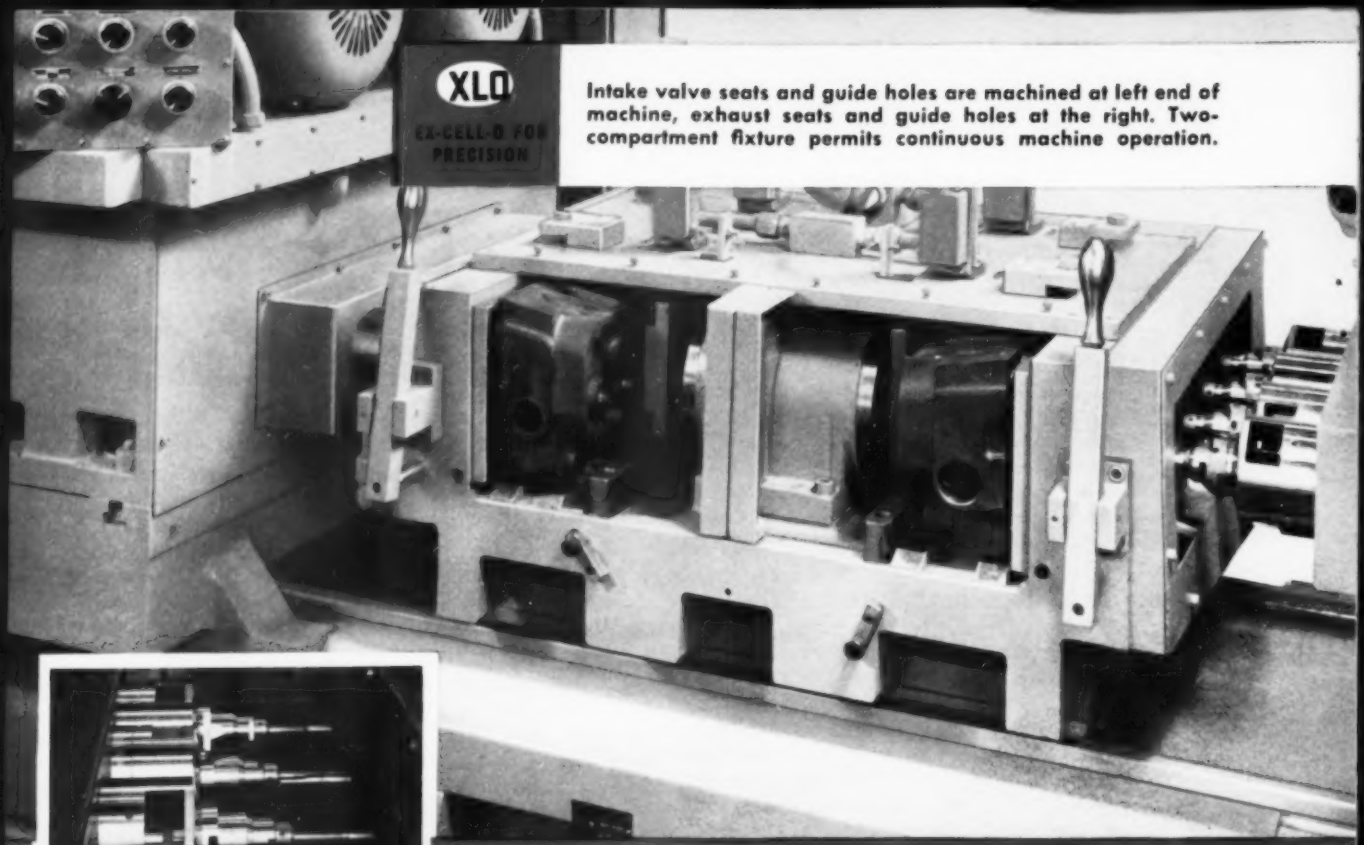
A 300% increase in the efficiency of grinding wheels made with A-1100 Silane coating for abrasive grains is reported by the Silicones Div of Union Carbide Corp. Added wheel strength is achieved because the coating reacts chemically with both the resin and the grit, thus acting as a bridge between the organic and inorganic materials. Improvement was measured in pounds of wheel wear per hour vs pounds of steel removed. Coating adds only ½ to 1% to cost of wheels.

Foam for filters...

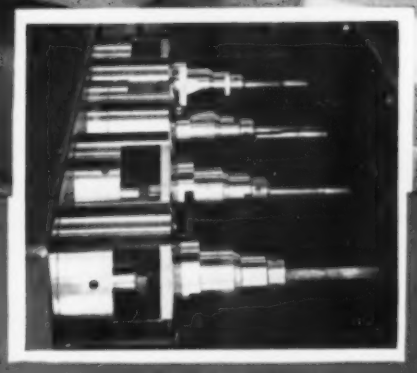
Potentially useful in a wide variety of pneumatic, air-moving, and air-cleaning equipment, a recently developed open-celled urethane foam acts as the air filter in Philco's new line of window air conditioners, Scott Paper Co reports. Claimed to "collect dirt from the inside out," loading in depth instead of just at the face, the foam, made by Scott, is installed easily.

High-strength plastic...

A new group of structural plastics developed by Aerojet-General is claimed to have the highest strength-weight ratio ever achieved. At this time Aerojet-General will say only that the unusual strength results from filament-winding and metal-to-metal bonding methods never previously used with plastics. Details are classified.



Intake valve seats and guide holes are machined at left end of machine, exhaust seats and guide holes at the right. Two-compartment fixture permits continuous machine operation.



Gun-type drills extend through spindle centers and retract automatically

CONCENTRICITY GUARANTEED

58-10

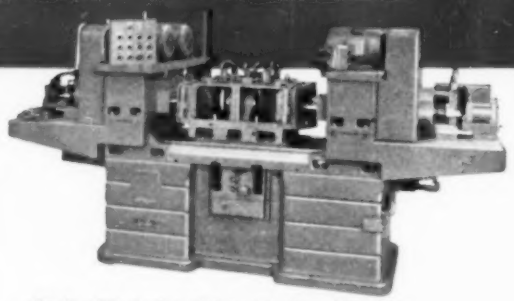
Bor-Drils valve guide holes and plunge-faces valve seats in one operation

A Standard Ex-Cell-O 17-A Precision Boring Machine, equipped for the Bor-Dril process, is turning out 23 cylinder heads per hour for a large auto manufacturer.

The table rapid-traverse feeds cylinder heads to the left into four cutters that plunge-face intake valve seats, then retract .020". Next, four gun-type drills advance through the spindle shafts to Bor-Dril guide holes from the solid—with guaranteed concentricity. The table then moves to the right, repeating the process on exhaust valve seats and guide holes.

Find out how the Bor-Dril process can help speed production in your plant; contact your local Ex-Cell-O Representative, or write direct.

CIRCLE 270 READER SERVICE CARD



Style 17-A Precision Boring Machine equipped for Bor-Dril process drills deep holes from the solid with guaranteed accuracy.

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WHAT'S AHEAD... in Metalworking

TRENDS

The climb back to the top continues...

Metalworking production is heading toward higher ground. American Machinist Production Index, which reflects the manhours worked throughout the metalworking industry, went up two points in March and is expected to rise further the second quarter.

The significance of the recovery is best understood when one looks at the ascending production curve since last April. Now at an estimated 169, with 1947-1949 taken as 100, the index is 15 points higher than it was a year ago.

Marked improvement in automobile assemblies is partly responsible for the gain. A sizable upturn in electrical machinery, including appliances, also has contributed to the betterment.

Recovery is not confined, however, to any special segment of Metalworking. It is rather widespread, running through a multitude of products.

Best of all, demand for capital goods finally has come off dead-center and is moving again. Increased spending for new plant and equipment this year over last will help to put Metalworking on a firm high plateau.

Big question right now is will there be a prolonged steel strike? And although there has been some softening of the previously unanimous opinion that there will be one, industry consensus is that there will be some sort of stoppage.

Meanwhile, steel mills are racing toward a six-month production record—with operating rates running to about 92% of capacity.

Production might be even greater if it weren't for a shortage of rail facilities needed to get the steel from the mill to customer cars and flat-bed trucks. Already noted are some minor shortages in flat-rolled products and galvanized sheet. Deliveries are stretching out on other products, too.

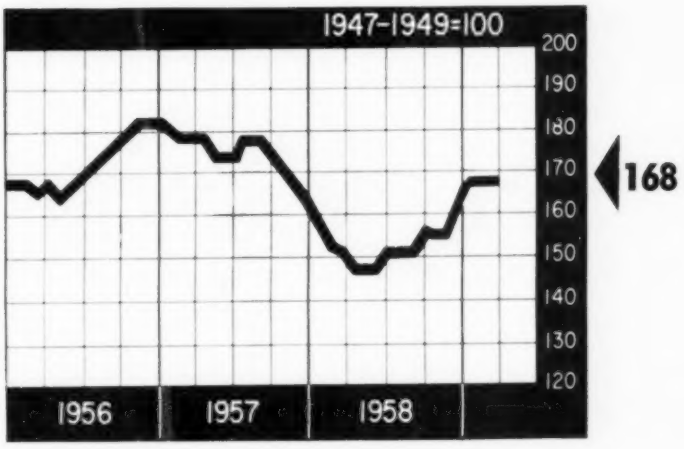
Customer demand is so great today that steel warehouses are unable to build up their inventories by an extra 10% or so before the June 30 strike deadline. Warehousemen are now urging customers to come in and work out a planned program of their needs to insure a continued supply of steel in the event of a strike.

Production of automotive parts has arrived at a good, fairly steady level of operations. Parts suppliers, at automakers' request have been laying in steel supplies as a strike hedge, but most of them think the strike won't last long.

Best gains in the parts field are being posted in production of replacements—an uptrend that began more than a year ago and will probably continue at least through 1963. One reason: of the 73.6-million cars on the road in 1958, 50 million were more than three years old.

Appliance inventories are "at an irreducible minimum" and appliance makers are using steel so fast they're having trouble building up inventories as protection against a strike. (Normal steel inventories for appliance makers are about 45 days.)

Farm equipment sales and production continue to climb and at least one major manufacturer is chalking up records month by month. One company reports tractor sales rose 68% in the first four months of this year, and crawler tractor sales in February were 50% ahead of the sales total for February 1958.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

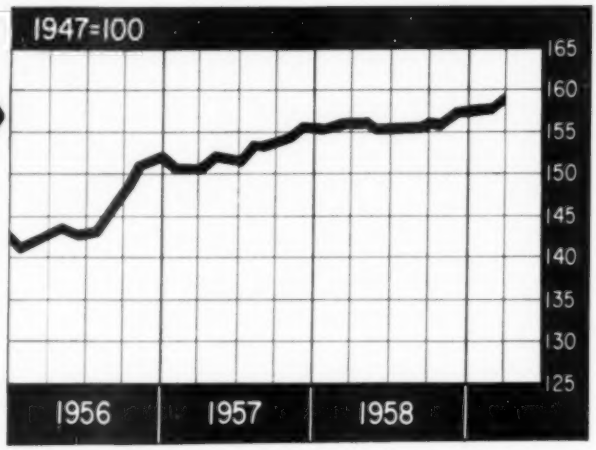
	MAR Estimated	FEB Preliminary	JAN Revised	FEB Year Ago
Total Index	**163**	**166**	**166**	**153**
Machinery	135	131	128	
Electrical Machinery	197	199	177	
Autos	128	135	104	
Other Transportation	329	325	324	
Other Metalworking	145	143	130	

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAR Estimated	FEB Preliminary	JAN Revised	FEB Year Ago
Total Index	**158.6**	**158.4**	**158.2**	**156.0**
Metalworking Machinery	182.6	182.4	182.5	
Other Machinery exc. Electrical	169.9	169.3	166.2	
Electrical Machinery	158.9	158.9	157.5	
Fabricated Metal Products	148.7	148.6	146.6	

158.6



The bloom is back on the boom...

Business in the United States continues to march forward. The gross national product will top $470 billion in the second quarter of 1959. Latest estimates put GNP at $464 billion in the second quarter of the year. Government spending is on the rise and increased spending by consumers for autos and other durable goods and housing have contributed to the over-all gain in national product. The biggest push has come from the build-up of inventories, as predicted earlier.

A recent survey by the US Department of Commerce indicates that the capital goods boom is only around the corner, and may be with us by year end. The latest survey puts investment in new plant and equipment at $1.5 billion higher this year than last year. This is roughly a 4% gain. The actual increase will probably top 5% before 1959 capital investment figures are final.

But even with booming business, the employment and unemployment picture has not yet changed. The total number of unemployed persons held at 4.7 million in February. This was down 400,000 from February a year ago but was still very high for any other February in our history except for the depression years. The number of unemployed covered by insurance benefits also has not improved very strikingly.

Declines in unemployment occurred in New York, New Jersey and Pennsylvania because of a pre-Easter pick-up in the apparel industry. An increase in unemployment took place in Michigan because of a strike in the glass industry but this has been settled so unemployment in that state has probably declined in March.

Employment in nonfarm and farm jobs held about the same level in February as in January. The total for both months was roughly 62.7 million jobs. March will see some slight seasonal pickup, but nothing to indicate the size of the current US boom in business.

The number of jobs held by production and related workers in manufacturing increased slightly in February. This is the first time factory jobs in February were higher than in January since 1955. Of course the main reason for the jump in factory employment in February was due to the pick-up in steel. But little change in factory jobs is expected over the next few months.

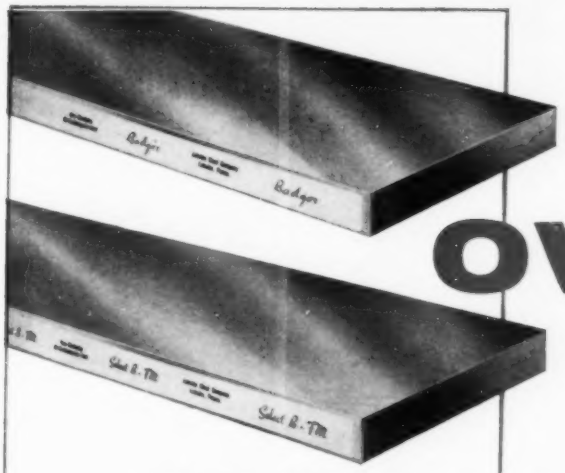
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	151.0	151.5	124.6
Steel ingot operation (thousands of tons)	2,627	2,631	1,366
Electric power output (million Kilowatt hours)	12,900	12,996	11,645
Production of automobiles and trucks	171,608	168,020	104,928
Engineering construction awards (Eng. News-Record—millions)	$355.4	$393.7	$441.2

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	144	143	130
Index of durable manufactures production (1947-1949=100)*	155	153	137
Durable goods manufacturers' sales, millions*	$13,686	$13,613	$12,646
Machinery manufacturers' sales, millions*	$ 4,027	$ 3,975	$ 3,847
Durable goods manufacturers' new orders, millions	$13,823	$13,673	$10,704
Machinery manufacturers' new orders, millions	$ 3,865	$ 4,047	$ 3,336
New Orders for Nonelectrical Machinery (1950=100)*	177	161	120
New Contracts for Industrial Construction (1950=100)*	122	97	98

* Seasonally adjusted



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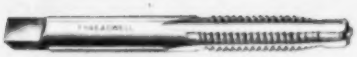
***First* with piloted taps** . . . . . 

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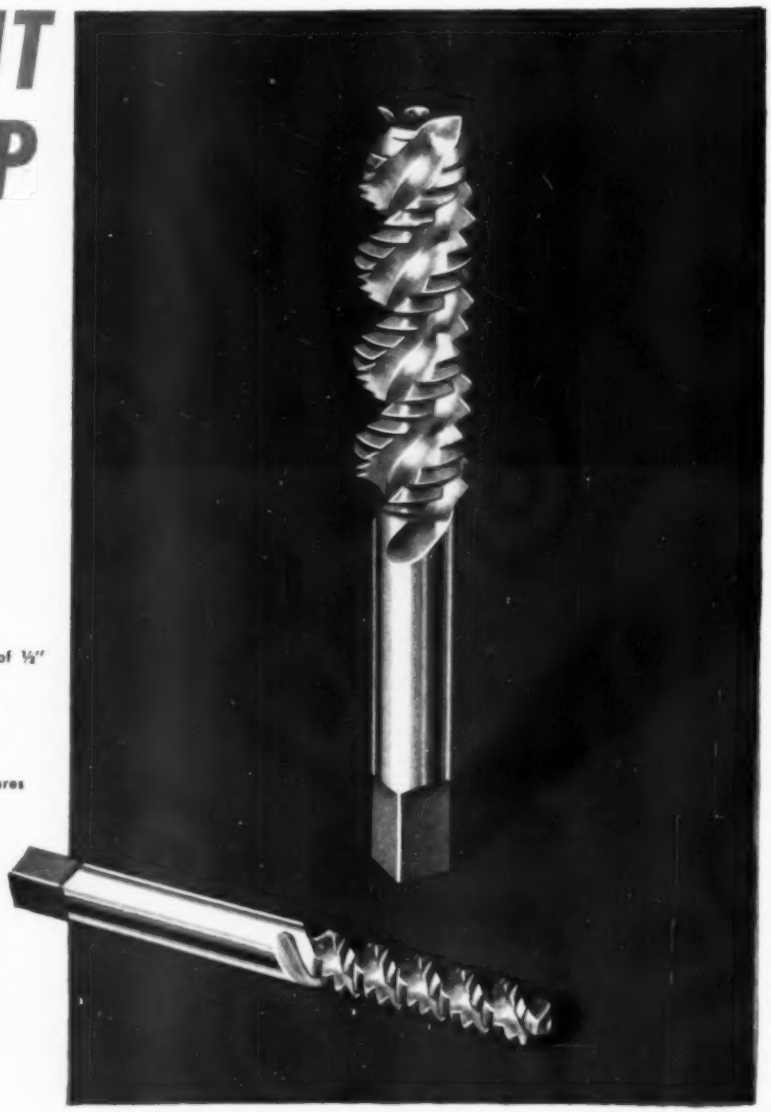

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Production: 70 pieces/minute
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American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Strange Talk From On Top

Washington seems to be completely mesmerized by the quick-war concept.

Curtis LeMay and his fellow generals in the Air Force apparently have done a thorough and astounding job of selling the administration on the fact that if war should come, it will be over before most of us realize that it has started.

After a few hours or days, we will be the victors or the vanquished. There will be no in-between. All or nothing.

There won't be time . . .

to mobilize as we did in World War II and the Korean War. The only thing that will count will be what is available and in being at the time that this unprecedented war happens.

Dedicated to this theory, the Air Force High Command puts only a slight value on machine tools. Reserves will be useless, because the war will be over in a jiffy. No good in keeping "packages" of machine tools around. No good in maintaining a National Industrial Equipment Reserve of general-purpose machine tools. No good in being dedicated to the proposition that a strong machine tool industry is a great national asset.

So we now hear talk around Washington that machine tools are not essential to national defense. Strange talk, to put it mildly.

Remember when France . . .

staked its national security on the invincible Maginot Line. The Line may have been invincible against the weapons of the day, but there was nothing to prevent the Germans from bypassing it. And that is exactly what they did.

Why are our generals so sure that if war should come, it will be a colossal nuclear war? Isn't it possible that both sides may be so awestruck at the cataclysmic consequences of a nuclear war that they might cling to more traditional weapons? It happened with poison gas.

And if we got involved in any kind of conventional warfare, just what are we going to do about producing the necessary weapons, when machine tools no longer are essential?

Even if the horrors of a nuclear war should unexpectedly burst upon us, no one can say for sure, not even the Air Force generals, that we will not survive to fight on. And if we do, our first and foremost need will be machine tools on which to make the all-important weapons of defense.

So it just might be a good idea to reevaluate our plans and not stake our entire defense potential on a quick war and nothing else. It also might be a good idea for Washington to reevaluate what the machine tool industry means to the nation's defense.

In World War II we produced a prodigious volume of machine tools—about as many as were installed in all of Metalworking at the war's start. Though one eminent government official stated that machine tools are no more important than pots and pans, drastic priorities were clamped on machine tools at the time of Korea and the industry again was asked to produce at a top rate.

Khrushchev is not making . . .

the mistake of classing machine tools with pots and pans. He has been engaged for a long time in expanding Russia's machine tool industry to top rank among all Soviet industries. He apparently would like nothing better than to acquire for his own factories some of our big, productive US-designed machine tools.

Fortunately for us, our government circles, including Congress, contain knowledgeable officials who realize the true worth of machine tools and of the industry that builds them. These officials could do no greater public service than to help reconstruct the rightful position of the machine tool industry, nuclear war or no nuclear war, in our defense program.

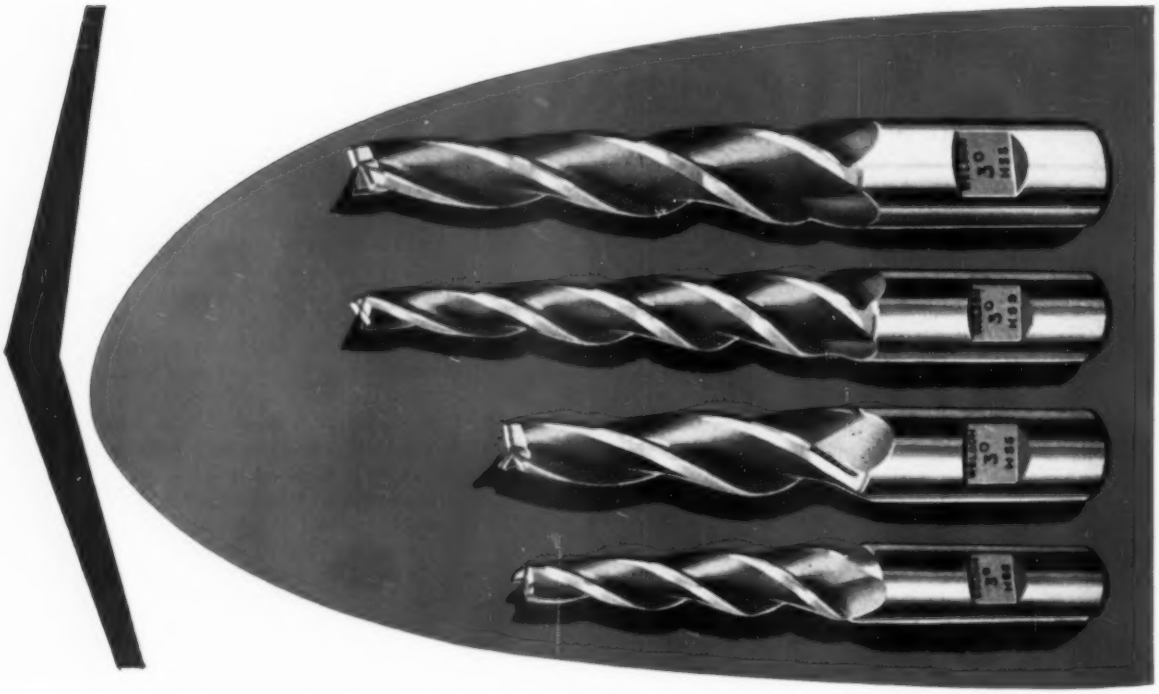
Burnham Finney EDITOR

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON / TAPERED END MILLS

DIE SINKING CUTTERS

CONSTANT SPIRAL FLUTES



• The extensive line of the well known Weldon End Mills includes Tapered End Mills, Constant Spiral. Also known as Die Sinking Cutters, these end mills, filling a definite need, come in a wide range of sizes, giving a choice of many lengths and diameters.

Weldon Tapered End Mills as standard stock items are all 3-flute, and offer a choice of ½°, 1°, 1½°, 2°, 3°, 5°, and 7° angles, taper on side. They represent the same high quality for which all Weldon End Mills are famous.

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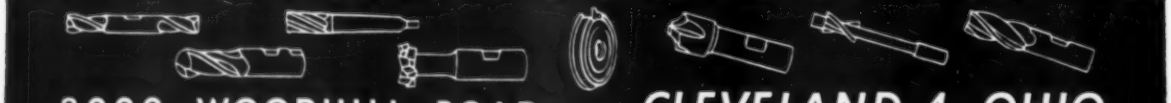

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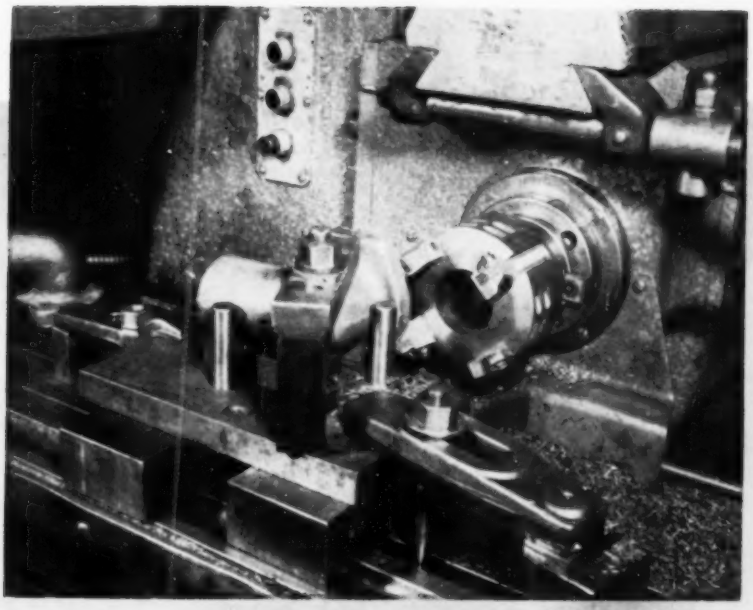


1100 fpm . . . boosted tool cost to $6.15/8-hr day, but reduced machining cost 56%. Malleable-iron castings are milled across flange faces at Daco

it's a 10:1 bet that...
Most of your machines are loafing

By Charles R Demmitt and Richard L Peterson, tool engineers, Kennametal, Inc, Latrobe, Pa

You can cut machining costs in half on many parts if you specify speeds and feeds for throwaway carbides that result in 30-minute life for each cutting edge. Production examples prove that it doesn't pay to baby your cutting tools.

The true measure of machining efficiency is total cost per piece produced. Tool cost/pc is only a small portion of the total when all factors —machine time, direct labor, overhead—are considered. Tool cost alone should therefore not govern decisions about cutting speeds and feeds.

A number of plants in the Chicago area are proving out this "30 minutes to profits" approach for carbide throwaways. This is the formula: Where machine, workpiece, and finish permit, increase feeds and speeds to the point where tool life per cutting edge is 30 min actual time in the cut. Some plants find it more profitable to work toward even shorter tool life—in a few cases the average is 12-15 min.

Results have been startling—some production has been increased 100% at a cost of 5 to 10% in tools, and in some cases the tool cost has been multiplied 15 to 20 times, yet total cost/pc has been materially reduced.

Savings are possible because of these reasons:

1. Throwaway bits reduce tool cost/cutting edge when they replace single-point brazed tools because regrinding is eliminated. Overhead is reduced because cutter grinders are not required.

2. Throwaway bits save money when tools are replaced because the bit only has to be turned in its holder. This also improves accuracy because the toolholder does not have to be repositioned.

3. Higher feeds and speeds are possible because the machining cycle no longer has to be based partly on tool-life requirements. Machinability ratings for work materials are not required because feeds and speeds can be increased until the desired 20-30 min is achieved.

Most plants are not using speeds and feeds high enough for best cutting conditions with cemented carbides. It is a false impression that money can be saved by making these tools last longer.

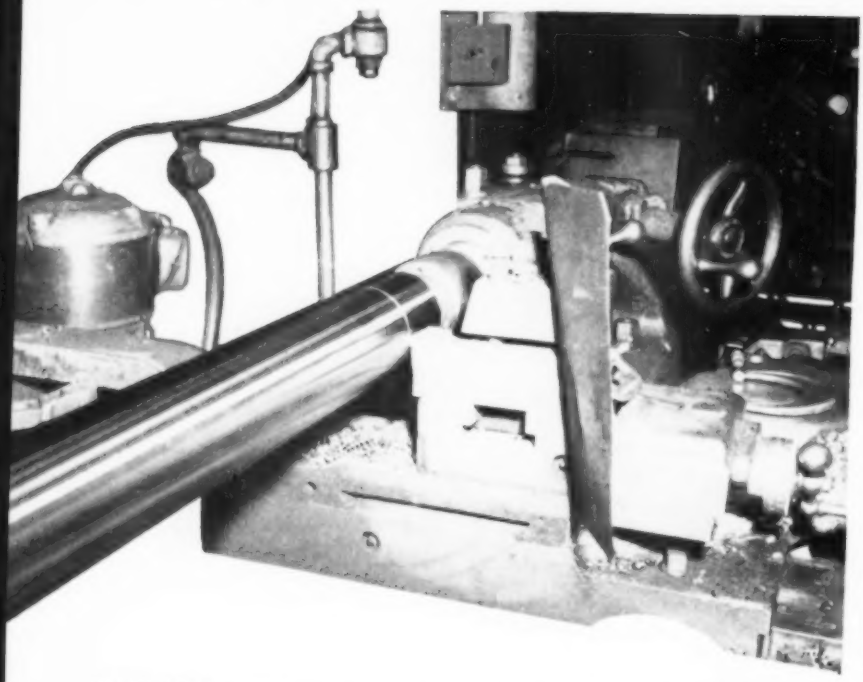
Of course, some operations cannot be speeded; the machine may not be rigid enough or have enough power, the workpiece may be too weak to stand the pressure, or finish requirements may dictate slow speeds and/or fine feeds. Even so, the "30-min tool life" approach can make some improvement in almost every job.

Where more than one tool is applied in a setup, as on a turret lathe or multi-spindle automatic, the time required to index throwaway bits may be an important factor in reaching lowest cost/pc. In such cases, an average cutting life longer than 30 min may be necessary for best results.

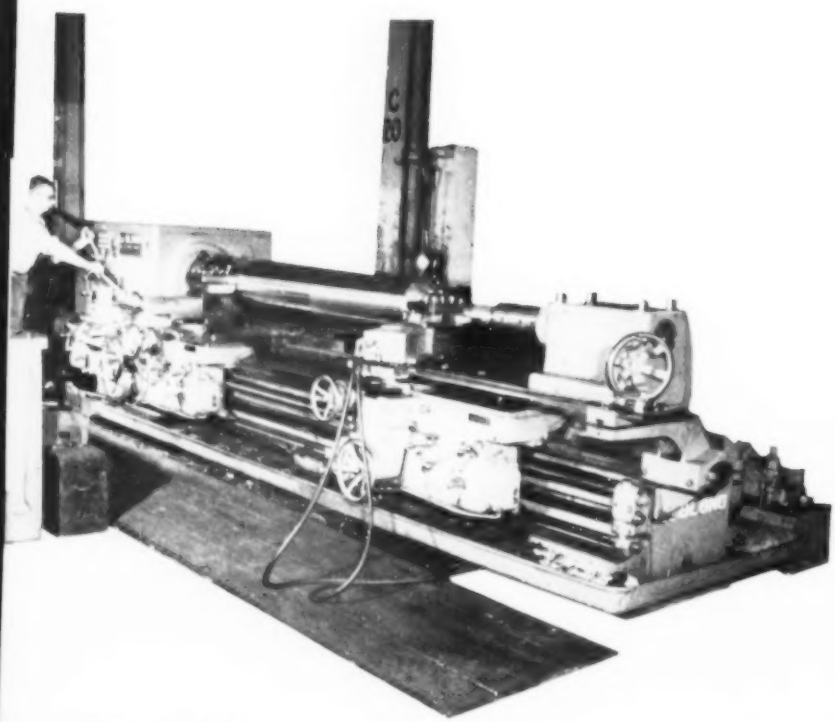
For all jobs, the correct carbide composition and best cutting-edge geometry are important, and sometimes these must be changed to suit faster cutting conditions.

Savings with faster cutting rates can be made with multiple bits, as at Daco, Inc, Aurora, Ill, where malleable-iron elbows are face milled. Cost/pc was reduced from $0.502 to $0.22 when speed was raised to 1100 fpm for the 5-in., four-blade Kennamill cutter. Only change in the conventional setup on a Cincinnati bed-type miller was, in addition to faster speed and feed, to change the

Most of your machines are loafing . . .



60-in. shaft . . . is turned in 194 sec to reduce machining cost/shaft from $3.05 to $0.87 and jump production/day from 21 to 81 shafts. Stock is 5¼ in. in dia, and is cut ⅛ in. deep by tools that last 19 min/edge at Brunken & Goodwin



800 cu in. of chips . . . are removed by two throwaway edges, which hold up for about 30 min each. Forged 1045 printing-press cylinder made by Goss is 72 in. long, 15½ in. dia

cutter body to one with sufficient space between blades for rapid chip clearance.

Feed rate for the grade K6 square bits was raised from 1⅝ to 7½ ipm for a ⅛-in.-deep single-pass cut. This reduced tool life from 240 to 30 min, which jumped tool cost to $6.15/8-hr day, and raised total operating cost from $56.00 to $60.92/day. But production jumped from 112 to 277 pc/day, and cost/pc was lowered a profitable 56%. Finish on the work was considerably improved, too.

More Examples

Outstanding savings on steel shafts have been made at Brunken & Goodwin Tool & Engineering Co, Maywood, Ill, by speeding up turning operations. In several cases the total cost/pc has been reduced 70-75% in spite of 10-to-1 boosts in tool cost.

One example is a 14-in.-long stepped shaft turned from AISI 4140 mill-rolled bar on a 20-hp Warner & Swasey turret lathe. When grade K4H square carbide bits were installed in a KTAR-85 Kendex clamping holder and cutting speed was raised from 250 to 650 sfpm, cutting-edge life dropped from 240 to 25 min. But production/day was raised from 51 to 224 shafts, and total machining cost reduced about 75% from $0.941 to $0.227/pc. This gain was made in spite of the fact that tool cost rose from $0.33/day ($0.0065/pc) to $3.14/day ($0.014/pc).

On many lathe jobs, Brunken & Goodwin are increasing speed and/or feed until tool life is reduced to approximately 20 min/cutting edge. Sacrificing tool life to gain profits has proved worthwhile.

Another job at Brunken & Goodwin was 72-in. shafts of hot-rolled AISI 8620; hardness 18-20 R_c. These were centered, then turned for a length of 8-12 in. at one end, and finally reversed for the long end remaining. Work was done on a 20-hp Monarch model N; originally with ½-in. triangular grade K7H in Kendex negative-rake holders, and at 290 sfpm with 0.014-ipr feed and ⅛-in. depth of cut. Tool life was 120 min/edge, and tool cost was $1.18/day —machining cost was $3.05/pc, total.

But the tool chattered, so speed was increased from 226 rpm up to 700 rpm, finally, where chatter disappeared. Feed was increased to 0.026 ipr, and cutting-edge life dropped to around 19 min. This boosted tool cost to $7.45/8-hr day, an increase of more than 530%. But at the same time production increased from 21 to 81 shafts/day, and

machining cost/pc dropped to $0.87, a decrease of more than 70%.

At Goss Printing Press Co, Chicago, a special double-carriage 50-hp LeBlond tracer lathe has been operated for some time at conventional speeds to turn AISI 1045 forged printing-press cylinders. Grade K7H square carbide bits have replaced brazed-tip carbide tools, and now two cutting edges can remove 800 cu ft of stock. Here, too, machining cost has been reduced, but tool cost has not changed appreciably.

At Stephens-Adamson Mfg Co, Aurora, Ill, tooling cost/pc was cut approximately a third when speeds and feeds were boosted. Tool life/cutting edge was reduced from 2 hr to 1 hr, 20 min while turning head shafts 150 in. long and 16½ in. in dia in a 50-hp American Pacemaker engine lathe. At the increased speed, 2000 lb of chips from a forged AISI 1045 shaft were cut in 41 hr instead of 94 hr. Turning was done with ¾-in. triangular bits with ⅛-in. nose radius. It is estimated that further tests to reduce cutting-edge life to 30 min would have reduced cutting time for each shaft to 20 hr.

In another large midwestern metalworking plant, where it is now standard practice to work toward 30 min of cutting-edge life with throwaway bits, machining time has been cut from 52.5 to 21.5 min on long cylindrical steel castings. Tool life dropped from 120 to 22 min/cutting edge when speed was boosted from 14.8 to 37 rpm on the 14-in. diameters. Work was done in a Bullard Cutmaster VTL.

Machining cost/pc was cut $4.68 with grade K21 bits cutting ¼ in. deep and feeding at 0.031 ipr. Surface speed was increased from 170 to 410 sfpm.

Defense spending upturn ahead?

Despite the administration's hold-down on defense spending, all signs point to a continued rise in military outlays—with most of the increase earmarked for development and production of missiles, electronics, and other defense hardware.

- Pentagon budget officials have just upped their defense spending estimate for the current year ending June 30 to a minimum of $41 billion. This is at least $200 million over the most recent official estimate made less than three months ago, at least $1.2 billion over the initial estimate for fiscal 1959 made over 18 months ago. Behind the unscheduled rise are steep over-runs in costs for major hard goods projects.
- Congressional Democrats are building up a case for extra defense appropriations, primarily for a step-up in ICBM production. The issue is being generated through the defense policy investigation by the Senate's Armed Services Preparedness Subcommittee, headed by Majority Leader Lyndon Johnson, and through military appropriation hearings in both houses of Congress.

Meantime, a proposal is being pushed within the administration to boost ICBM production in fiscal 1960, starting next July 1, beyond present schedules by diverting funds now earmarked for production of manned bombers and related systems.

The proposal reflects the acceptance of many Washington officials that ICBM output must be increased to offset serious criticism that the US is consciously allowing Russia to build up missile superiority.

But the proposal also reflects the administration's continuing concern over economics in defense. It represents a belief that if missile expenditures are to be boosted, military budget cuts must be made elsewhere to maintain the delicate budget balance.

As some officials see it, the most obvious area for reductions is manned bombers. Over the objections of many administration officials, the new budget provides some $2.4 billion in new orders for procurement of bombers, tankers, and subsystems, and for accelerated development of the B-70.

The sum is $800 million more than the volume of new Air Force contracts planned for Atlas and Titan ICBM production and Minuteman ICBM research and development.

Included on the Air Force's shopping list for the new year are 70 more Boeing B-52s (about 640 have already been produced or are on order), 40 more Convair B-58 medium-range supersonic bombers (66 have already been delivered or ordered), and 96 more Boeing KC-135 jet tanker planes.

The critics argue that such steep bomber expenditures are unnecessary, that the US has already established overwhelming bomber superiority over Russia. Latest US intelligence estimates place Russia's force of long-range turboprop and jet bombers at no more than 125. The US has about 500 heavy jet bombers now in operation, and about 140 more on order.

But the Russians are expected to outproduce us at least three times in liquid-propellant ICBMs over the next two years or so. So, the argument runs, the Pentagon can afford to divert funds from bombers for an ICBM step-up.

The Air Force's top brass, however, opposes the diversion. General White, Chief of Staff, is against over-investment on first-generation ICBMs, believes that all-out ICBM production should await the development of more advanced solid-fueled missiles. General LeMay, Vice Chief of Staff and former SAC commander, reportedly feels the same way. LeMay, indeed, is fighting for still more bomber production than the new budget provides.

Recent publication of closed-door House Defense Appropriation Committee hearings has brought out the fact that administration budget-cutters slashed military production proposals across the board.

The Army wanted at least $1.5 billion more to tool up for production of the Nike-Zeus anti-missile missile and to buy more armored vehicles, electronic gear, tactical missiles, and other so-called conventional arms to modernize ground forces.

The Air Force unsuccessfully sought more funds to replace the B-47 medium bombers at a faster rate with both B-52s and B-58s, to build a prototype nuclear-powered plane, and for base construction and operations and maintenance.

The Navy wanted a sharp speed-up in production of Polaris subs and missiles, another atomic-powered super aircraft carrier, more planes and smaller vessels, continuation of Regulus II missile production, and a major increase in anti-submarine warfare forces.

Military testimony before Johnson's Committee has stressed these points. The military chiefs agreed lamely, however, that the fiscal 1960 budget is generally "adequate"—but mostly on the assumption that there will be significant budget hikes for fiscal 1961.

Here's how Ryan blasts tough metals into complex shapes

New explosive forming facility at Ryan Aeronautical's San Diego plant. Die and part are lowered into water-filled pit before explosion

High-energy forming is getting a big play at Ryan Aeronautical Co, San Diego—and no wonder. Ryan has been using explosive forming to produce complex aircraft parts from hard-to-form Space Age alloys in something like 15 minutes, compared with 8 to 10 hours required to do the same job by conventional methods. Tests have been so successful, in fact, that Ryan is now installing a complete high-energy forming facility at San Diego.

At Ryan, a metal part is placed in a die and the assembly is immersed in a water-filled pit. Then an explosive charge is positioned within the die. Set off, the explosive forces the water against the part and into the shape of the die. Water blows out the top like a geyser as the metal is moved into shape at speeds of 200 to 500 feet per second (conventional methods move metal at 5 fps).

By this method, Ryan can instantly form hemispheres, bell shapes, corrugations, deep draws, embossments and other complex shapes from tough metals with almost no spring-back or work-hardening.

Under test now are a wide variety of alloys and explosives. The latter include TNT, nitroglycerine and lower-powered ammonia gel.

A Ryan employee holds perfectly shaped jet engine part—explosive formed from metal blank at right

WESTERN METAL SHOW REPORT

"Explosive forming is the hottest new development in aircraft and missile metalworking." Maybe they didn't put it in just those words, but that's what production men were telling each other at the 11th Western Metals Exposition in Los Angeles.

Said one, "It's now becoming obvious that conventional forming methods just can't shape the ultra-high-strength materials now coming into use in the latest aircraft and missile systems. In fact, our forming problems will become even more severe as the top strength limits of steels and other metals continue to increase."

And that in a nutshell explains why high-energy forming stole the limelight in the week-long (March 16 to 20) Exposition. Sessions drew top crowds, consisted of panel discussions on four aspects of high-energy forming: formable materials, energy transmittal media (explosives), dies and die materials, and production applications.

Munitions makers interested

More and more companies are turning to explosive forming, among them a generous sprinkling of munitions manufacturers. Representatives of these companies (interested, naturally, because it's a new market for them) were scattered throughout the audience, helped keep discussions moving at a fast pace.

Panel members generally confined their talks to their own firms' experiences with the new technique. Aerojet General's man, for instance, said that his company is actively soliciting high-energy forming subcontracting work, will do the work at its $500,000 test facility in Chino Hills, Calif., near Los Angeles.

Heavily instrumented, the facility is equipped with special transducers, recorders and high-speed photographic gear to provide complete data on its forming processes. Included is a camera that takes 2½ million frames a second!

Aerojet, incidentally, displayed an impressive variety of parts shaped

EXPLOSIVE FORMING
goes over with a bang

by high-energy forming, some of them held to 0.0001 in. tolerance. One of the parts shown was a Cassinian dome 50 inches in diameter. Among the materials formed by Aerojet are Vascojet 1000 and Tricent.

Convair came into the act with a discussion of its Dynapak (high-energy-forming machine tool) by S R Carpenter, who said (1) that the gas-actuated Dynapak is currently turning out extrusions from such tough materials as tungsten, columbium, zirconium and titanium, and (2) turning them out to closer tolerances and at greater savings than ever before possible.

Convair's theories that metals flow like a viscous fluid when subjected to high-energy forming came in for some criticism by other researchers. Their contention: metals behave hydrodynamically (like a liquid) when formed at very high temperatures only — not when they're cold formed.

Panel members were pretty well agreed that for the present at least high-energy forming is particularly valuable in making parts needed in limited quantities — in situations where it isn't economically feasible to use press and die equipment. And the panelists felt that high-energy forming will be used increasingly in compacting and casting. Right now, because of high development costs, explosive forming is pretty well limted to the aircraft and missile industry, but it seems to be just a matter of time before other industries adopt the technique.

Oddly enough, it turns out that very few companies are conducting basic research in high-energy forming. As one Lockheed representative put it, "Everybody is banging away at explosive forming, but most activity is directed toward developing small increments of knowledge to satisfy immediate production needs."

John S Rinehart of the Colorado School of Mines brought this problem into focus, "The explosive forming industry only can come into full and successful production when we have developed a clear understanding of the dynamics of the forming process during each of its stages. . . . Our most critical need is data which can easily be used by our design engineers."

Speaking on an entirely different topic, performance requirements of solid-propellant missile airframes, during one of the opening sessions of the Exposition, Aerojet-General's L E Zwissler noted that one of the major causes of failure in such airframes has been defective welding. And, he added, the sooner welding of solid rocket motor cases can be cut down or eliminated entirely, the better.

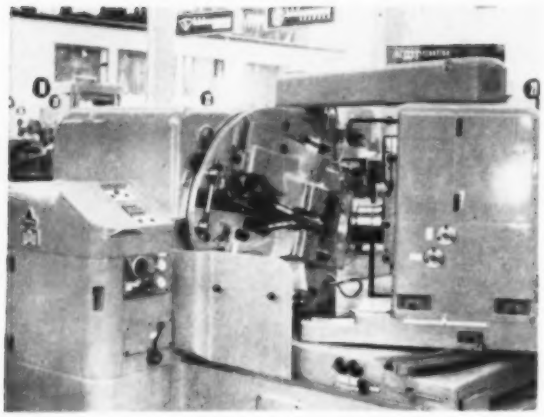
Still another problem in development of ultra-high-strength pressure vessels for rockets, he said, is getting steel that meets requirements. Present mill practices aren't adequate to control the purity or the chemistry of such steels, he added. Not only that, the mills don't seem able to produce rolled sheet to sufficiently low thickness variations.

Exhibit draws 60,000

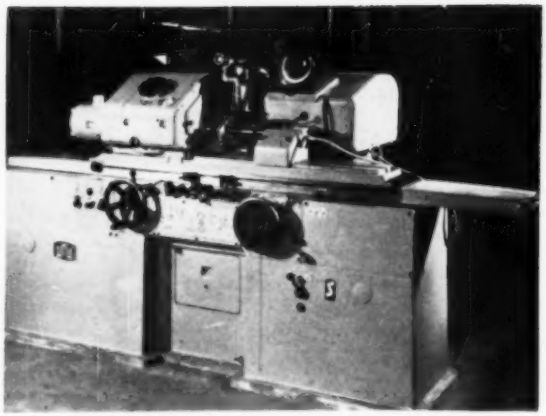
The Western Metals Exhibit, held concurrently in the Pan-Pacific Auditorium, had more than 400 booths. Top attention-getter was Linde's new photocell tracer—a device that uses pencil or ink line drawings to control single or multi-torch flame-cutting machines, eliminating need for costly templets.

The tracer contains an automatic kerf or cut compensator that eliminates need for making an allowance for cut width on drawings. The compensator is set for the required plate thickness, thereafter automatically compensates for cut width so that the reproduced parts are the same size as the line drawing.

Congress technical sessions drew more than 6000 people, while Show attendance exceeded 60,000 during the five-day run. Participating societies included American Society for Metals, American Welding Society, American Institute of Mining and Metallurgical Engineers, and Society for Non-Destructive Testing.



Bevel gear hobber . . .
. . . has a pair of inserted-tooth overlapping milling cutters (450-mm dia) which generate crowned flanks, cuts gears up to 500 mm, and has a workhead that swivels through 90°. Milling spindle speeds range from 11.2 to 71 rpm: hobbing speeds are infinitely variable to 1.6 mm per sec. This universal machine is intended for rough and finish operations. Standard assemblies can be recombined to form other gear units, including a cone-type milling cutter for heavy roughing



Cylindrical grinder with feedback size control . . .
After roughing is done with normal infeed, caliper air gage on table automatically swings up over the work for duration of the finish cut. An electrical circuit controls wheelhead feed and table travel, stops machine when size has been reached. Large dia shows progress of work. Limits can be set directly on dial by vernier-positioned pointers for plus and minus tolerances. Grinder has a 200-mm swing, 630-mm maximum working length. Measuring equipment is by Carl Zeiss

East Germany launches its bid

The recent Leipzig Fair made it clear that East Germany (long a weak sister to her Western counterpart) is fast becoming a force to be reckoned with as a producer of machine tools for world markets.

Out of 140 machines exhibited at Leipzig, more than 40 were either new designs or existing models with basic improvements. And because Leipzig is the showcase for Eastern Bloc industries, virtually all machines exhibited were produced by nationalized factories whose programs were coordinated by centralized planning authorities. The significance of this is clear—practically every new development in machine tools represents a trend rather than an individual machine.

For example, standard units from which a variety of machines can be built were much in evidence at Leipzig—iron curtain versions of the U S's building block machine tool components. Heavy millers (single or double column, with rotary or longitudinal beds) can be assembled from basic columns, cross beams, spindle heads and tables.

High-volume production of such equipment is concentrated in a small number of specialized factories. Lathes and presses can be built up in the same way. The heavy duty miller and bevel gear hobber pictured above are constructed from such standard units.

Another East German trend noted at Leipzig is the fitting of basic machines with automatic loaders, unloaders and sizing equipment. And several examples were shown of two-position indexing or shuttling fixtures that allow manual loading with a minimum of interruption to the work cycle. Copy attachments for lathes have not only become more available in East Germany, the principle has been extended to planers.

Full automation is being approached by linking up standard tools with handling and transfer equipment in a flexible layout—rather than by the building of complex, specialized machines to do the same job. Demonstrated at Leipzig was a five-machine link line of this type. It turned out electric motor armature shafts. The line saws the work length from bar stock, end mills and centers, copy turns, and grinds both bearing diameters.

Conception and finish of East German machines shown at Leipzig were of equally high standard. It is clear that the country still has some first class designers even though many of its top engineers and designers have fled to the West through Berlin.

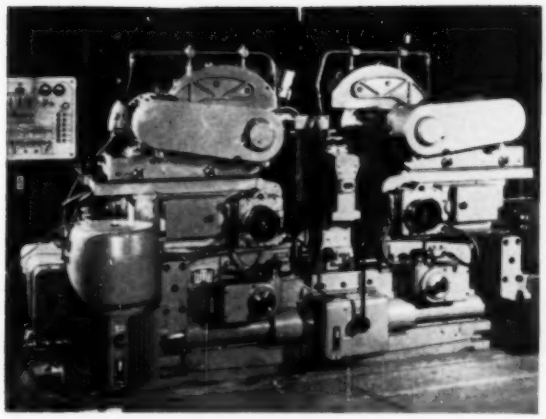
East Germany has invested large sums in training a new generation of specialists and skilled workers, and it encourages them to move ahead rapidly by offering them financial and social rewards. East Germany's machine tool industry is largely centered in the Sachsen-Thuringia area—a traditional German stronghold of machine tool talent.

Some 45,000 people are now employed in machine tool manufacture—averaging about 1000 workers per factory. And while East Germany will disclose its output only in percentages, it can be estimated from earlier-published figures that about 50,000 cutting and forming machines are being turned out per year—and that's considerably higher than the output of Great Britain.

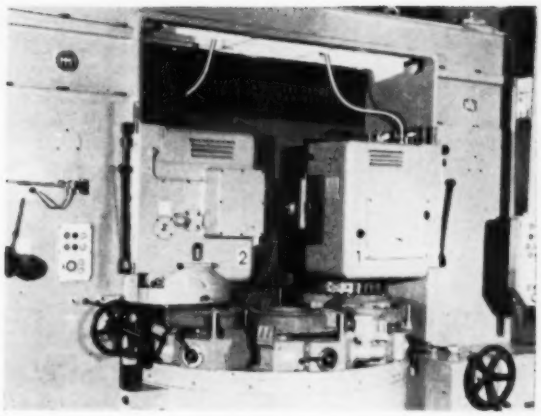
Accelerated expansion of East Germany's machine tool industry is already planned—present target for 1965 is doubling of 1957 overall metalworking production, while machine tool output is expected to triple in the same period.

Exports are keeping pace with the industry's rapid expansion—nearly doubled between 1955 and 1958—with vastly increased shipments to Eastern Bloc and non-Communist underdeveloped countries accounting for much of this rise.

But of even greater significance for the future is the coordination of production programs within the Soviet



Heavy-duty miller . . .
has 630-mm-dia cutters for roughing and finishing, machines both faces of tractor flywheel housings on 8-position rotary table. Alternate fixtures are for the two sides, and half-finished work is repositioned in the adjacent fixture by a hoist after each rotation of the table. Clamping is by air piped from a central turntable. Complete cycle time to mill both sides is 5 min, roughing is done at 90 meters per min, and finishing at 111 meters per minute. All components are standard



Double-ended grinder . . .
. . . is designed to grind external races of twin-track barrel roller bearings, has two opposed wheels (one for each race) carried on oscillating heads and in the same plane. At start of automatic cycle, wheelheads retract to allow loading a race on internal chuck of workhead, which can be angled up to ± 14°, according to taper. Wheels then feed in for rough cut, with drive for swivelling motion variable to 10°. Turning axis is a quarter-dia from contact face. Fine grinding is cam controlled

for world machine tool markets

orbit, plus the division of type specialization among the member countries.

It has been officially revealed that (through overly zealous pursuit of self-sufficiency) the Eastern Bloc has now acquired an aggregate capacity to make 1893 basic types of cutting machines and 1454 forming machines —for a total of 3347 individual, although perhaps similar, units. This excludes size variations of a given machine model.

But now this total, on Russia's recommendation, is to be pared down to 2340 types. For East Germany this means a program reduction of 30% —from 872 types to 608. Now, East Germany will specialize in "intellectual" machines, leaving other Eastern Bloc countries to make more basic kinds.

For instance, manufacture of small vertical boring mills will be dropped, while production of crankshaft lathes and grinders is being shifted to Czechoslovakia and Poland. This frees East Germany to concentrate on high-performance and automated machines.

Latest figures show that while standard machines accounted for 64% of East German output in 1958, the proportion will drop to 40% by 1965. Meanwhile, the proportionate share of automatics will increase from 30 to 46% and that of fully automatic equipment from 6 to 14%.

If this international division of labor (part of an all-embracing scheme for economic integration of Soviet nations) evolves according to plan, Communist machine tool output will be much greater.

For one thing, overlap and duplication of research will be avoided —so that both research and production can be confined to those fields of endeavor that are most productive. Markets in neighboring countries will be assured, and absence of competition between Communist Bloc nations will give specialized manufacturers a clearer field for sales to world markets.

Special benefits will accrue to East Germany, which is rich in skills but poor in raw materials, so that it will be able to devote its energies to making machines with the highest labor content, and to cut down on heavy equipment requiring large quantities of scarce (for East Germany) material.

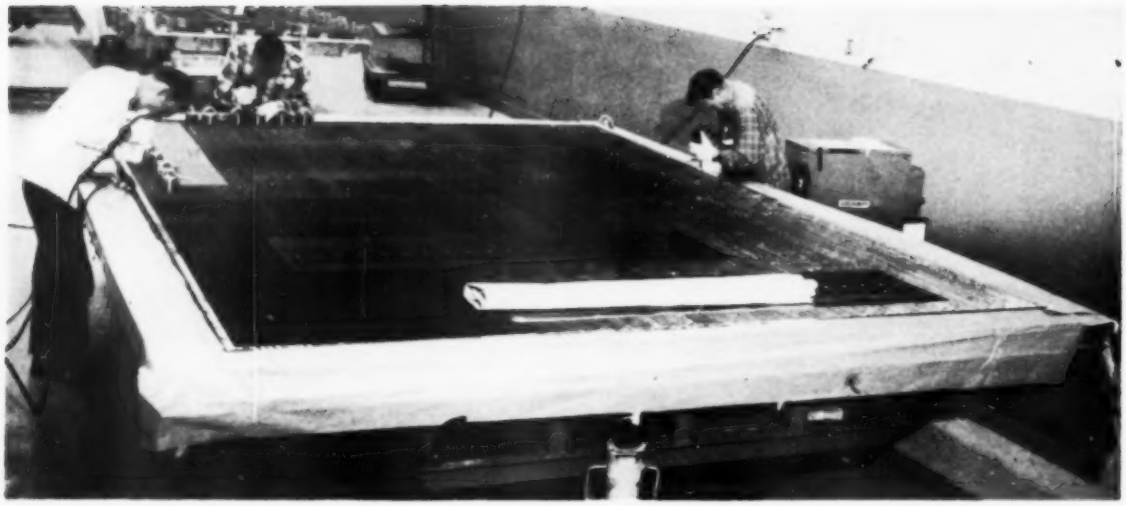
This program for intensification of joint Soviet Bloc industrial planning represents an about face from the policy of past years, when East Germany—severed from more heavily industrialized West Germany—was primarily concerned with making for itself virtually every type of machine that it formerly obtained from the West.

Yet many problems stand between theory and realization. They're mostly related to integrating a number of planned economies—a big stumbling block in the past.

To achieve industrial integration between nations, goods and ideas must move freely between the participants. But all trade between such nations is today conducted on a "balanced bi-laterial basis" that limits the flow of goods to the lower of two levels when one participant cannot maintain deliveries for any reason. In other words, all Communist nations cannot maintain the same industrial production and under the present setup, the top-producing nations might soon find themselves shouldering the entire output.

Another tough nut to crack for the Communist cooperative setup is an acknowledged weakness in cost accounting and in fixing real values for products. So is the task of establishing valid and acceptable relationships between the currencies of various nations.

Not only that, top heavy, slow-moving bureaucracies can tangle even the best-laid plans in a mass of red tape. The next few years will show whether East Germany and its allies can overcome these difficulties.



Spotwelding of four honeycomb core sections . . . is the first step in building a 10 by 14 foot panel for B-70 chemical bomber wings. Underneath the honeycomb is a sheet of brazing alloy and below that one stainless steel outer skin

Baking metalworking's biggest sandwich

A metal envelope - within - an - envelope is the secret of "static atmosphere" brazing, newest technique for producing honeycomb sandwich panels of unprecedented size. With it, North American is turning out stainless honeycomb panels up to 10 feet wide and 14 feet long—biggest ever built—for America's new B-70 "Valkyrie" chemical bomber.

The Valkyrie is going to hit altitudes above 70,000 feet at speeds beyond 2000 mph. For those reasons its wings must be able to resist unheard of heats and sonic vibrations. And that's why PH 15-7 molybdenum stainless steel (a new high-strength, heat-resistant, precipitation-hardening alloy) honeycomb has been picked for the job.

Core of the giant panels is 0.0015-in.-thick PH 15-7 Moly, ¾ in. high, with 3/16-in. cells sandwiched between 0.020-in.-thick sheets of the same material. Edge members are 0.032-in.-thick Z-angles with 1-in. legs.

Thin sheets of brazing alloy (92.5% silver, 0.5% lithium and 7% copper) are placed between the core and outer skins after the whole structure has been prefitted and cleaned. Brazing here is so critical that panel components are handled only in dust-free rooms by men wearing clean white gloves. Careful spotwelding holds the core, alloy and outer skins together for brazing.

At this point the new static atmosphere technique goes to work. North American normally employs three brazing methods—each chosen because of its economy and efficiency with relation to particular groups of sizes and shapes.

A die-quench technique is used for flat shapes and mild curvatures, while a salt bath accommodates small parts that require exceptional accuracy. Another new technique currently under development at North American employs electric blankets as a heat source. Its great advantage is that it has virtually no size limits.

Static atmosphere brazing of large honeycomb panels is done in a luminous-wall gas-fired furnace built to order for North American by Detroit's A F Holden & Co. Unique feature of this furnace is the carrying of an air-gas mixture through the walls and ceiling. When the walls are ignited, furnace temperature can be raised to 1700 F within one minute. For close temperature control and for uniform heating and cooling of the work, various ceiling and wall zones can be individually controlled.

First step in the static atmosphere process (after spotwelding) involves placing the sandwich in a special stainless steel retort, which is completely closed off except for a purge tube. After this inner retort is welded shut, the whole assembly is supported on a graphite block inside a larger outer retort.

The graphite block combines the advantages of physical stability and good thermal conductivity. And it keeps the work from warping at high temperatures.

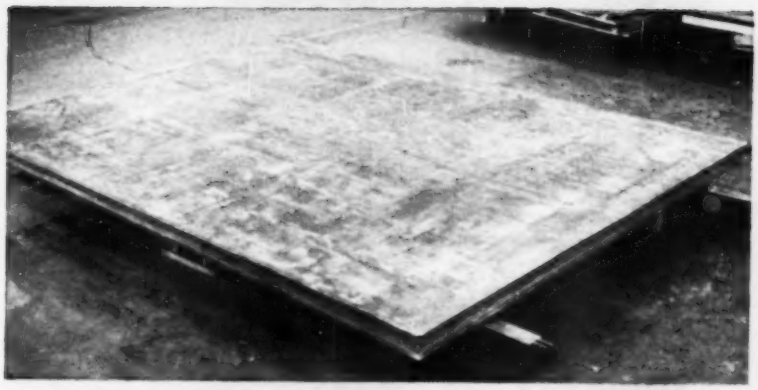
As the panel is sealed inside its own retort, it doesn't come into contact with the graphite—thus moisture needn't be baked out of the graphite to avoid work contamination.

A ¼-in.-thick sheet of copper is placed on each side of the inner retort to insure uniform heat transfer. On the side opposite the graphite, a sheet of ½-in. honeycomb core is placed over the copper. This core balances heat sink, prevents this side of the panel from heating or cooling more rapidly than the side resting on the graphite.

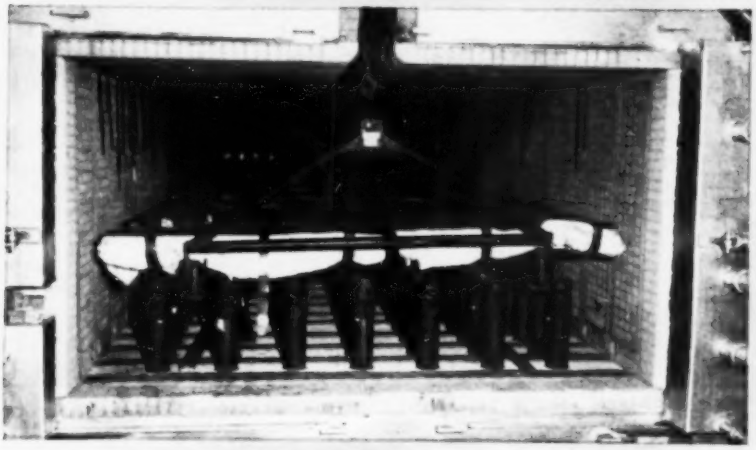
Achieving balanced heating

Biggest problem in brazing is to achieve balanced heating of sections that vary in thickness. Uniform cooling rates are equally critical. North American has found that copper sheet and honeycomb core solves both problems. Too, the final operation—wrapping a glass fiber insulating blanket around the outer retort—aids uniformity of heating and cooling, and it prevents overheating of thin sections of the work, and consequent cracking, warping and failures.

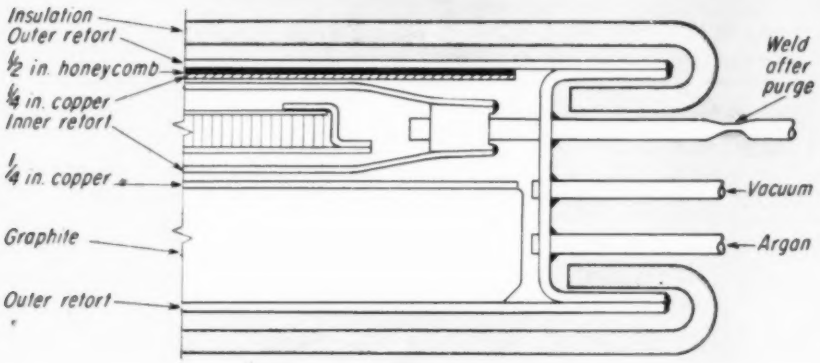
After the inner retort has been purged, the purge tube is welded shut, the outer retort is evacuated and filled with argon, and sealed.



Ready for brazing, the honeycomb structure is enclosed in special lightweight, compact retorts that help cut furnace cycle time. Only insulation remains to be wrapped around this assembly



Temperature control is maintained in this special brazing setup by 20 termocouples at the top and bottom surfaces of the work. Connected to a recorder, the thermocouples control temperatures over a 65° spread



Two envelopes protect honeycomb, and graphite block supports it. Even heat distribution is aided by ¼-in. copper sheets, ½-in. honeycomb core and insulation. Tubes to both envelopes are sealed shut during brazing

With previous methods, argon was fed into a retort continuously. Anywhere from four to eight bottles were used during the brazing cycle. With the static technique, only half a bottle is needed.

A special dolly carries the final assembly to the furnace, where the assembly is loaded onto hangars that enter a special slot in the top. From room temperature the furnace heat is gradually raised to brazing temperature (1625 F) over a 4½-hour period. This temperature is held for 18 minutes, then the furnace is cooled down to 1000 F over an hour-and-a-half period, then down to room temperature.

The whole assembly is then removed from the furnace and packed in dry ice for five hours of treatment at –110 F. During this time the panel stays inside the retort to prevent warpage.

The resulting brazed panel meets yield strength requirements of 200,000 psi and ultimate tensile strength requirements of 225,000 to 265,000 psi. Elongation in 2 inches is a minimum of 4%.

MACHINE TOOL & EQUIPMENT EVALUATION GUIDE

PLANT Schenectady DEPARTMENT Mfg. Services

Alternatives

(Purchase New) x Acquire by Transfer
Purchase Used Major Overhaul

DESCRIPTION

	PRESENT	PROPOSED
1. Name of Machine	[redacted] Engine Lathe	[redacted] Engine Lathe
2. Type, Size and Horsepower	14 in. x 60 in. 15 horsepower	24 in. x 60 in. 30 horsepower
3. G. E. Cat. No.	32145	–
4. Year Manufactured	1946	1957
5. Year Acquired by G. E.	1946	1957
6. First Cost (or Major Overhaul) Incl. Shipping and Installation	$ 10,000	$ 18,000
7. Present Book Value	$ 833	$ 18,000
8. Present Market Value	$ 4000	$ 18,000

9. Present Machine will be used in PRESENT DEPT. x OFFERED FOR TRANS. OFFERED FOR SALE

COST COMPARISON (Next Year)

	PRESENT	PROPOSED	GAIN OR (LOSS)
10. Direct Labor	$ 9400	$ 3840	$ 5560
11. Indirect Labor	–	–	–
12. Fringe Benefits (20%)	1880	768	1112
13. Spoilage and Scrap	300	100	200
14. Direct Material	–	–	–
15. Maintenance (Ordinary)	200	100	100
16. Minor Overhaul	1500	–	1500
17. Expense Tools	1100	600	500
18. Special Tools	–	–	–
19. Utilities – Power	258	227	31
20. Taxes and Insurance (3%)	300	540	(240)
21. Other	–	–	–
22. Depreciation	833	1500	(667)
23. TOTAL	$ 15,771	$ 7675	$ 8096

24. COST COMPARISON OVER EXPECTED MACHINE OR JOB LIFE

Yr.	Present	Proposed	Savings Before Tax	Federal (52%) Income Tax	Net Savings	Depreciation Difference	Cumulative Cash Flow
1	$ 15,771	$ 7675	$ 8096	$ 4210	$ 3886	$ 667	$ 4553
(a) 2	14,271	7675	6596	3429	3167	667	8387
(b) 3	13,438	7675	5763	2997	2766	1500	12653
4	13,438	7675	5763	2997	2766	1500	16919
5	13,438	7675	5763	2997	2766	1500	21185
6							
7							
8							
9							
10							
11							
12							

25. RECOVERY OF EXPENDITURE IN 4 1/2 YEARS.

Prepared By B. S. Sleeper Date 1/28/57

(a) No minor overhaul
(b) No depreciation charge

GE devises simplified cash-flow replacement formula

Frequently the decision as to whether or not a company needs a new piece of capital equipment, machine tool or otherwise, is determined by the effect of the purchase on the company's cash position. This factor may be far more influential than the age or productivity of the equipment to be replaced.

Even at the General Electric Company, individually managed departments, decentralized as they are, find themselves faced with the problem of maintaining cash liquidity. Maximum return is expected on invested capital, but not at the expense of being too cash poor for efficient day-to-day operation.

Managers of General Electric Departments make their own decisions. The departments are not as likely to go into "bankruptcy" as many small companies which overinvest and weaken their cash fluidity if the manager spends too much, but the situation is similar. Profit ratios must be maintained.

How does a manager decide the most profitable way to spend his money on equipment? Will he: overhaul present equipment, purchase new equipment, purchase used equipment, or acquire the machine he needs by getting it from the surplus of another department? Two basic alternatives are open to him in selecting equipment for investment: hunch or formula (AM—Oct 20 '58, pM16).

Bernard S Sleeper, manufacturing and machine tool engineer, in GE's Manufacturing Laboratory thinks that formulas are safer—if they aren't too complicated to be practical. He has offered to the department managers a simple, one-page form which, when properly completed, presents a graphic comparison of the costs involved in equipment replacement. Called the Machine Tool & Equipment Evaluation Guide, this form is more of a balance sheet than it is a "formula." All of the calculations involved are arithmetical.

As shown, analysis starts with some one filling in the pertinent details describing the present and the proposed equipment. Then the operating costs for the two machines are compared, as in the new MAPI formula, for the first full year of operation (next year). Finally, the costs are compared over the expected equipment or job life.

Cumulative cash flow, for each year of expected operation, is determined by adding the depreciation difference (or straight depreciation after present equipment has been fully depreciated) to the net savings after deduction of the 52% Federal Income Tax. The result is the amount of cash released for other purposes by acquisition of the new equipment.

The number of years necessary to accumulate sufficient cash flow to recover the initial expenditure is a rating for replacement. While only a signal, because other factors must be weighed, rapid recovery of the investment suggests some urgency in the need to replace.

Theoretically, a difference of a dollar in net savings spells replacement, but there are various other factors which should be taken into account, such as anticipated service life of the proposed machine and its relation to deterioration and obsolescence. Also to be considered are the effect on floor space, inventory turnover, material handling, downtime, and the elimination of safety hazards. Installation time is a factor, too.

With these factors properly weighed, select the alternative that offers the best dollar investment. The result, of course, will be more reliable if you work with carefully collected records and use practical cost data.

Main target: lick obsolescence by better machine tool selling

If the U S economy is to achieve an annual growth of 5% compared with the 3% rate in the past, a major share of the gain must come from increased productivity to which the machine tool industry will contribute heavily, Leo A Hoegh, director Office of Civil and Defense Mobilization, told members of the American Machine Tool Distributors' Association at their spring meeting at the Sheraton Park in Washington, D C, March 18-19. Mr Hoegh showed a keen awareness of the problem of keeping American metalworking plants modern by citing figures from AMERICAN MACHINIST'S 1958 Inventory of Metalworking Equipment and indicated his sympathy with "aid-giving tax provisions" as a means of helping to lick the obsolescence problem. He particularly cited enactment of the "small business" accelerated depreciation provision by Congress as a good beginning.

$21 million for Service machines

About $21 million will be spent in the current fiscal year by the armed services for new machine tools to replace obsolete machines, John H Williams, Department of Defense, declared. The remaining $19 million appropriated for replacement will be reprogrammed for other purposes with a higher priority rating. If such reprogramming action is to be halted in the future, a vigorous educational job needs to be done on top defense officials to impress upon them the importance of replacement.

Of 24,000 machine tools declared excess by the armed services in fiscal 1958, only about 8000 will find their way onto the commercial market, Howard W Smith, OCDM, revealed. Around 3000 will go into the National Industrial Equipment Reserve. Some 2500 are of pre-World War II vintage and an additional 1500 are in poor condition.

New plants and expansion of existing plants, replacement of obsolete machines, and creative selling are the sources of new orders for the machine tool industry, J Herbert Myers, Cincinnati Shaper Co, stated. He stressed the fact that neither the industry nor its customers are static. Example: aircraft industry by necessity is getting out of aluminum as the "hot plane" programs develop. The "hot planes" will not be like their forebears and neither will the machines with which they are made.

The machine tool industry should present to the proper federal government agencies all the facts relating to the weakening of its position as one of the nation's most essential industries and ask what can and should be done to correct the situation in the national interest, Joel Barlow, Covington and Burling, Washington, suggested. Mr Barlow expressed the hope that, under the aegis of the U S Chamber of Commerce, the country's leading business organizations would get together and hammer out an acceptable realistic depreciation policy on capital goods.

The machine tool salesman of 1979, 20 years from now, will have to "forfeit some of his purely technical knowledge of machine tool operation in favor of more conversant knowledge of business management, finance, accounting, law and government regulations," James O Ellison, assocation president and president of Harron, Rickard & McCone Co of Northern California, predicted. Much of his success will depend upon his ability to make effective use of the assistance given him by other people connected with his sales endeavor.

The sales engineer in 1979 won't be selling both a bench mill and a $500,000 numerically-controlled milling machine, Mr Ellison said. He also will not be calling on both the 10-man jobbing shop and the 10,000 man industrial plant. He will be selling machines with more than half the unit sales value represented by components not manufactured by the machine tool builder involved. He will offer completely new types of machines for metalworking jobs that do not exist today. He will represent builders not now in the machine tool business. He probably will have to include a preventive maintenance program or service as part of the initial sales negotiations with certain of the complicated machines that he will be selling.

Mr Ellison feels that 20 years hence the machine tool sales engineer will "be talking of accuracy in the terms of ten millionths with about the same frequency that he talks of a ten thousandth today." He will be dealing with the "machining of alloys virtually unknown now and with processes such as machining at elevated temperatures on a frequent basis." To be top-flight, this sales engineer will have had to complete an engineering degree, with some graduate work added in related subjects. He also will have gone through a period of training in the industry and through several years of upgrading. He will not have achieved his rank and stature much before the age of 35 and will not be likely to hold a top outside selling job much past 60.

"The sales engineer cannot differ radically in his knowledge or his personal conduct or his general business stature from the people he calls on or from the people he works for," Mr Ellison pointed out. More and more men with a good solid degree in engineering are involved in machine tool buying, he said.

Awards for proposals

Twelve members of AMTDA received awards in a nation-wide contest to advance the art of preparing machine tool proposals and to show industry how today's machine tools can reduce costs, increase efficiency and productivity, and why they are a good investment. The winners:

Category A, proposals on general-purpose tools under $10,000: First place, Tom Prentice of Machinery Associates Inc; second place, Roger Stultz of Walker Machinery Co; third place, Mrs Luise G Moran of Buffalo Machinery Co Inc.

Category B, proposals on general-purpose tools costing not over $50,000: First place, Harry Becker of Wm Halpern Co Inc; second place, Pat Greene of Dayton & Bakewell; third place, W F Wolf of Harron, Rickard & McCone Co of Southern California.

Category C, proposals on general or special-purpose machine tools costing $50,000 or more: First place, Richard Webb of Marshall & Huschart Machinery Co; second place, Allan Bergeron of Harron, Rickard & McCone Co of Northern California; third place, Harvey Hallenberg of E L Essley Machinery Co.

Honorable mention awards were made to the Seifreat Elstad Machinery Co, Macaulay Machinery Co Inc. and the E A Kinsey Co.

Simplified transformer tanks

True-circle roller eliminates flat section on leading edge of sheet as the stock is formed into a tube. Flat sheet is first punched, then stencilled (foreground) before roll is formed. Beyond roll former, tube is welded and ground off

spark mechanized welding

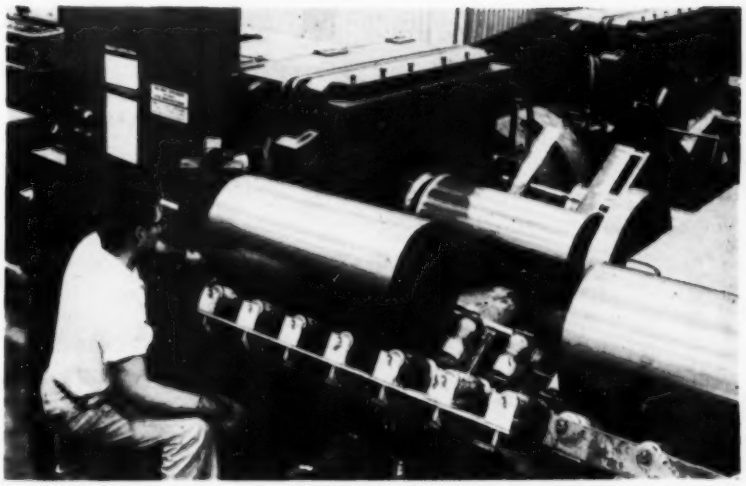
By R W Burger, manufacturing engineer, and J H Cordner, supervisor, manufacturing laboratory & equipment development, Westinghouse Electric Corp, Athens, Ga

Transformer tanks for power distribution are being welded and assembled on a new $1-million mechanized line that proves the tie-in between product design and production technique. To allow the new line to handle all tanks rated from 5 to 250 kva, Westinghouse had to review and improve their design, reducing variations in size and specification 42%.

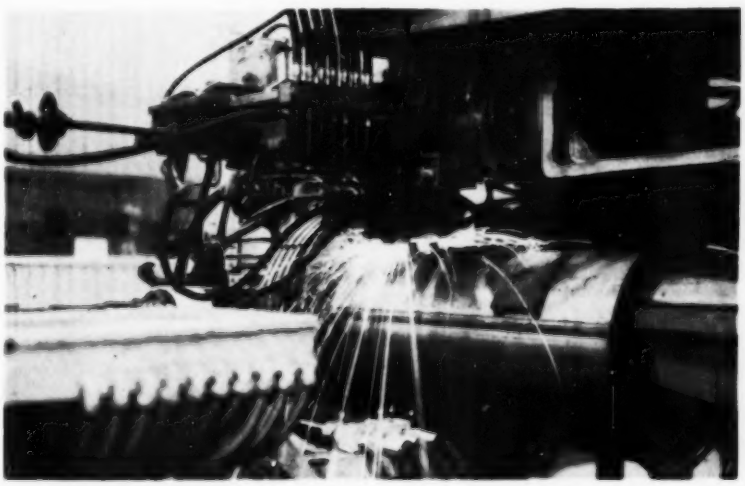
Simplification was necessary to convert these tanks to a design that would take them out of the job-shop category, for example:

- One gage of steel for tank walls and bottoms now replaces three.
- Each tank diameter is now available in only four or less tank heights, instead of eight. Heights increase in increments of 2 in.
- Four lengths of cooling fins, with only two on a given tank, now replace 21 lengths. Fins are also located only at 18° intervals around the tank OD.

These improvements came about because dimensions and specifications for the whole series of tanks were reduced to a single "master drawing" that covers all sizes.



Ends are beaded and flanged . . . at one of two hydraulic machines. Other machine is being set up for a run on another work size



Arc welder adds pads . . . with work held by an automatic positioner that locates pad spots by cam tracks. Arrestor pad, ground pad, and cover-locating pad are all the same

Simpler fabrication

The production load is handled in two shifts by 15 pieces of major equipment, which replace 33 machines that were arranged in two lines instead of the present one. The new line includes five single-phase projection welders and two resistance seam welders. Powered conveyors between the machines will hold 6-12 tanks each as "float," on which a machine may work while the previous machine is being set up for a different model.

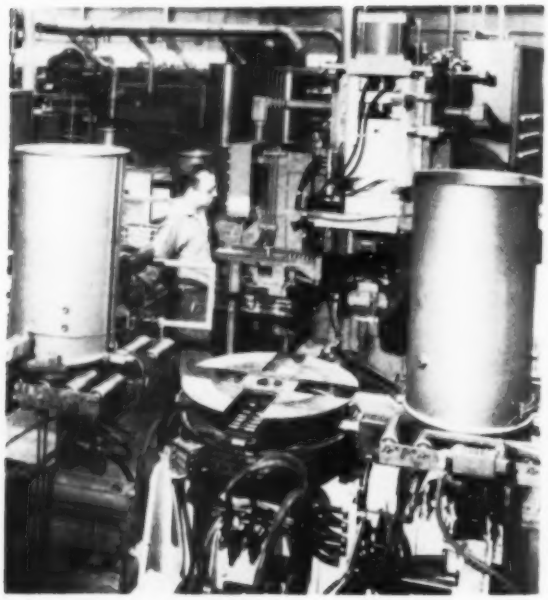
Setup change is made by resetting limit-switch stops on calibrated radial and longitudinal cam plates (which locate the tank for weld-spot position) and by adjusting a sequence switch at the operator's control station. If a new tank diameter is to be processed, three additional limit-switch stops are changed. Conversion takes only 5-10 min.

First welding operation is at a side-seam submerged-arc welder with a Westinghouse SA 40 welding head and controls—powered by a Westinghouse 650 amp dc welding machine. This seams the tank after it is rolled into a true circle. Tank shells are butted together so welding is continuous—no runoff tabs required. Welding speed is 70 ipm at 280-300 amps, 26 volts.

A grinding station cleans off 3 in. of weld at each tank end to separate the tanks, then the tanks are conveyed to one of two beading and flanging machines which form the ends of each tank shell.

Pads to which functional parts will later be attached are welded onto

Mechanized welding . . .



Welding positioner . . .
picks up tank from roller conveyor, tilts it 90° to horizontal, and moves it into welder throat. Cams and Cypak static controls make positioner pick up all radial and longitudinal locations. Pads are fed from hopper

Vertical bottom-seam welder . . .
is a unique machine that seals a double seam. Bottom plates are hopper fed, sprayed with latex compound, then fed to join tanks

the shells at two spotwelding machines—12,200 amps, 28 cycles, 4800 lb force. Automatic positioners serve these and eight other welders, locating each tank radially and longitudinally by means of cam tracks.

Parts added

Vibratory hoppers and feeders bring in the pads to the machine so parts are assembled automatically. The welders are controlled by Cypak static units to sequence the work through required movements. Tanks are located by picking up the 7/16-in. hole punched before the stock was rolled, or the pad welded over the hole. Each tank is moved to a positioner by roller conveyor, from which the positioner lifts the tank, lowers it 90° to horizontal, then moves it into the welder throat a required distance. After welding, the positioner replaces the tank to vertical position on the next section of roller conveyor.

Two lifting lugs and a nameplate pad are welded to each tank at a projection welder—34,000 amps, 30 cycles, 3500 lb of force. Then two seam welders add fins at 75 ipm, 55,000 amps, 18 cycles, 3500 lb. Arms feed the fins and hold them in place for welding, which eliminates tack welding. Support beams and ground studs are assembled at another welder in the same manner, with automatic parts feed from hopper and vibratory bowl.

Welding line . . .
transfers tanks with rollers; positions them at each machine so fins, brackets, and fittings can be assembled. Note tilted tank (third down) being positioned

Hanger brackets are assembled with argon shield gas at a special machine with two arc-welding heads. Then a special hydraulic bottom seaming machine, the only one of its kind, adds bottom plates. This produces a strong, sealed bottom seam that withstands rough handling. The double seam forms a rim on which the tank can be rolled or rocked.

Leak tests are made with air pressure and penetrating oil that is detected by ultra-violet light if it seeps through a crack. After an automatic turnover station, the tanks are punched to produce bushing and circuit-breaker holes at two hydraulic presses.

Helical gear teeth are rounded on special equipment in the laboratory, where...

"Dream" gears are production parts

By Emil F Stuef, gear laboratory supervisor, National Broach & Machine Co, Detroit

Where do you get a single special gear, or a train of gears with precision far beyond commercial tolerances? They are obviously not production-line items, and jobbing shops cannot take them on because of the economics involved. The answer is the gear laboratory, set up with special machines where development work can achieve specific purposes.

Such a laboratory must have a definite development program that includes:

- Cutters for special tooth forms
- Gears of any size and type made exactly to print specs
- Special tooth forms and shapes for specific conditions
- Analysis of gear designs for practicality before they are produced
- Tolerances, materials, hardness, and other characteristics all specified for each job

With this kind of program, the laboratory can develop gears for missiles, instruments, and test equipment; and for research organizations, industrial engineering departments, and universities. Such a laboratory at National Broach has tooth-chamfering, shaving, honing, and inspection machines—all special designs for ultra-precision work. In addition, equipment for tooth rounding, internal shaping, and for rack shaving has been installed along with conventional production machines.

One tricky job the laboratory handled was a 48-pitch, 768-tooth gear of 430 stainless steel only ¼ in. thick. Concentricity of the teeth with the bore had to be held within 0.0003 in., tir. The 20°-pressure-angle teeth had to run in zero backlash with a mating gear. Flatness of the side on the gear was held within 0.002 in.

After stress relieving, the gear was mounted on special arbors for hobbing and shaving. A 5-in.-dia cutter was mounted in a laboratory shaver to obtain the required concentricity.

Another case was a heavy-load gear for a rocket-engine application. Exceptionally high core strength had to be combined with surface hardness of 63 R_c at the teeth and bearing surfaces. The entire gear had to be undercut and bored to reduce weight, which made it difficult to hold parallelism of the crown-shaved teeth within 0.0003 in. without distortion. Concentricity had to be within 0.0005 in. tir.

The gear blank was first turned on the OD and centered, then hobbed and shaved. Two proof diameters were ground on each end.

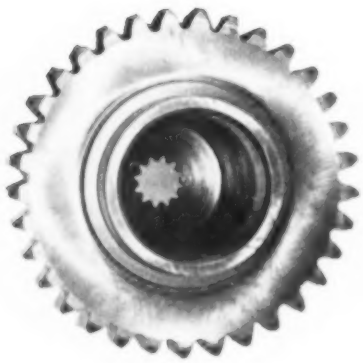
After the gear was carburized, stock was removed from these ends and an undercut produced next to the gear face. Hardening followed, and then the gear was finish machined, bored, undercut, finish ground, and spline-broached at one end. Boring followed hardening to avoid distortion. With the gear mounted between centers, concentricity was checked at the proof diameters.

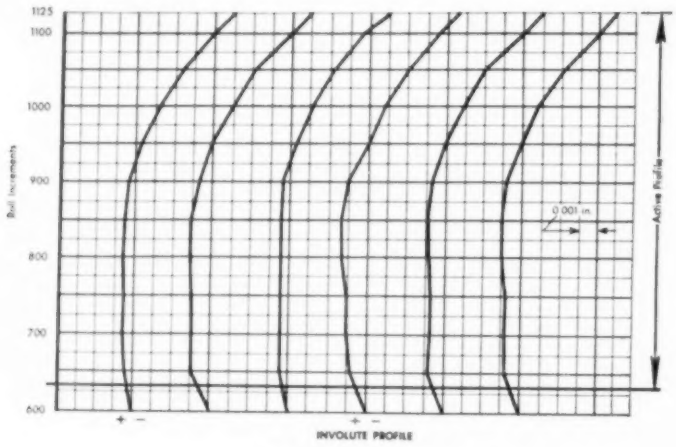
Carburized and hardened gears must have their leads corrected during hobbing, and their involute profiles and minor leads corrected during shaving. In such cases test parts are sometimes made to determine the amount of lead and involute modification necessary to produce the specified tooth shape.

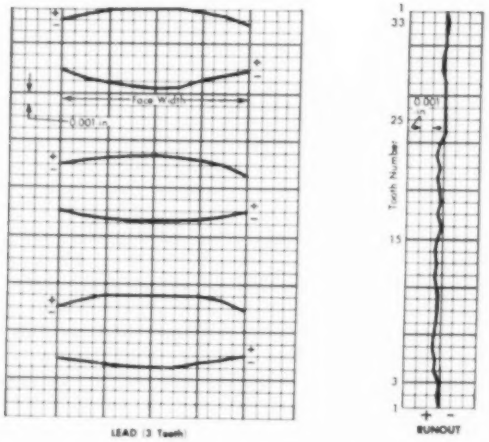
Among other jobs that required special efforts in the laboratory was a 4-in.-dia pinion for an aircraft application. It had to carry 2400 hp at 27,000 rpm for a specified period of time. Without the special tools and equipment available in the laboratory, work of this type would be virtually impossible, as well as economically impractical.

"Dream" gears are production parts . . .

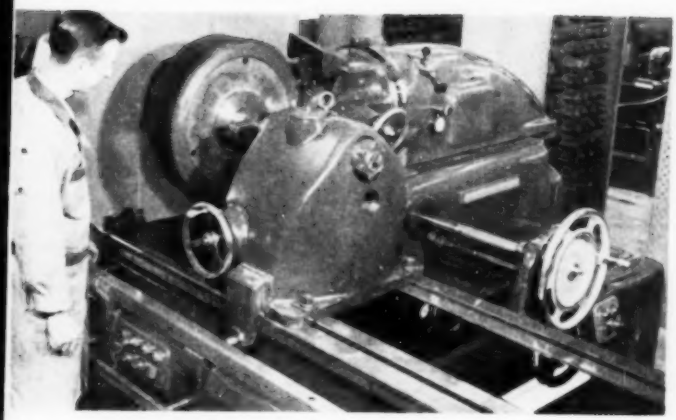
768 teeth are concentric . . . with the bore within 0.0003 in. on this gear for a testing turntable. Flatness is held to 0.002 in. over the entire face even though thickness is only ¼ in.



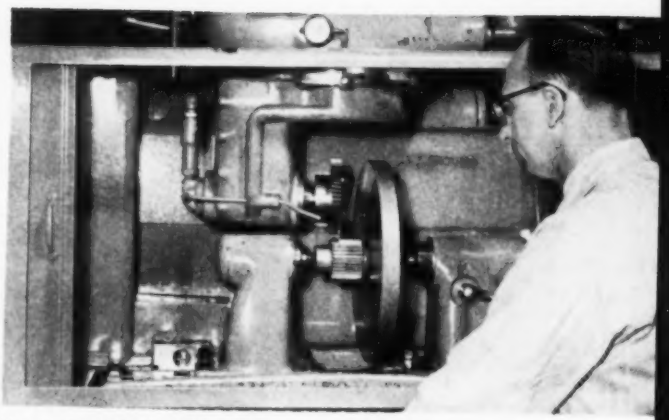




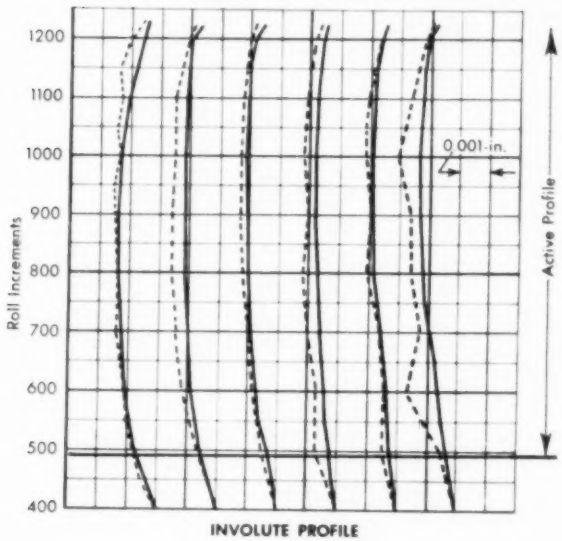
Core strength is 160,000 psi . . . for a steel rocket-engine gear. Teeth and outside bearing surfaces are 58-63 R_c. Runout is under 0.001 in. in spite of undercut and boring that reduce weight



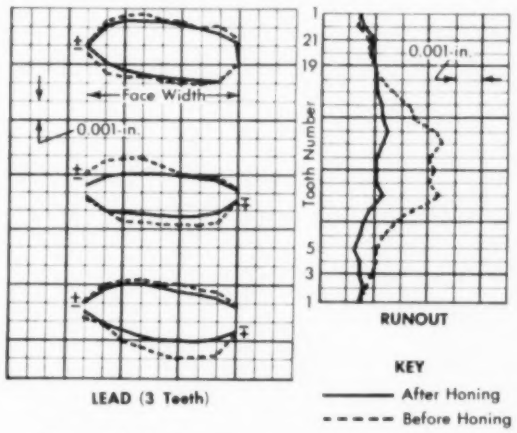
Special shaver . . . handles large precision gears up to a 38-in. OD; internal and external helical gears



Heat-treated shoulder gear . . . is shaved at 35-38 R_c with special head and 7-in. cutter, then hardened to 55-58 R_c. Concentricity is to 0.0005 in. Large gear is hobbed and shaved to produce 256 teeth. Both gears have maximum runout of 0.0005 in.



INVOLUTE PROFILE



Transmission gear . . . was honed in laboratory quantities (500 pc) to remove nicks, correct involute, lead, and concentricity. Stock is SAE 8620 forging

Small parts and stringers are assembled . . .
in the slots of a locating templet. Holes already drilled in small parts will locate holes to be drilled in base sheet. Table has perforated rubber mat that reduces drill damage

Redux bonding adhesive . . .
is applied in two steps, one with a brush, spray, or roller, second by dipping sticky surfaces in the powder part of the adhesive (table at rear). Heat and pressure are required to start curing

Adhesive bonding builds aircraft structures

By D E Winter, production engineer,
Fairchild Aircraft & Missile Div, Hagerstown, Md

Assemblies are riveted . . .
to prevent parts from shifting during bonding cycle. Spring-action Cleco pins hold parts until rivets are added

Bonding is less expensive than riveting, and it produces stronger, more rigid, and lighter structures. Fairchild Aircraft, Hagerstown, Md, is proving this by building 54% of the airframe for its new F-27 turboprop airliner with panels that include bonded joints. Production is centered around the largest integrated bonding facility in the country, and undoubtedly in the world.

Honeycomb is one feature of many of these strong, light panels, but bonded joints are also applied widely to laminated stringer and spar sections made of sheet stock. Critical structural members of the wing, fuselage, and tail are made by bonding several layers of thin aluminum channels and strips together with plastic adhesive, then curing the bonds and milling the structures to required contours.

Three bonding systems are applied: Redux (phenolic) and epoxy for F-27 parts, and a special Boeing formulation for B-52 components, which are being built under subcontract to Boeing. Each has its own particular area of advantage: the Boeing adhesive is required for B-52 parts; phenolic is mainly applied for flat panels and structural airframe members; and the epoxy is generally applied to honeycomb panels.

Production of bonded parts is at a separate 86,000-sq-ft building located away from the main F-27 assembly line. Layout is for straightline production that can later be converted to conveyorized operations with little change in methods. B-52 parts follow one line; F-27 parts another. There are some parallel operations on similar equipment, but not all parts follow the same sequence.

Minimum Fixturing

Tooling is as simple as possible for assemblies made of laminated sheet and honeycomb cores. A number of these assemblies are built up from small sheet-metal parts added to a main or base skin sheet. The small parts are predrilled and trimmed to size, then gathered at a subassembly table with the base sheet. A locating fixture made of a $\frac{1}{8}$-in. aluminum

plate fitted with braces is placed over the base sheet, then small parts are positioned in cutouts in the fixture. The assembly is checked, then holes are drilled in the base sheet by using predrilled holes in the small parts as bushings. This insures exact matching when the final assembly is made.

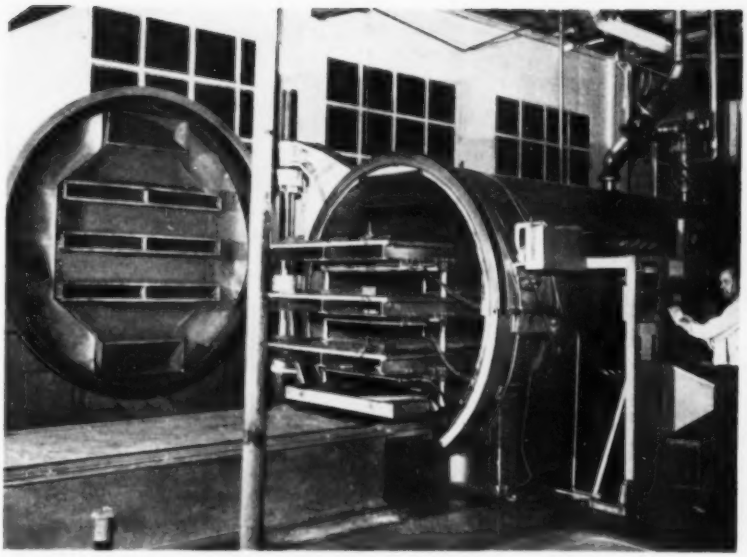
The parts are degreased, cleaned, and etched in an elaborate tank system. The single most important factor in adhesive bonding is clean metal surfaces, so this stage is most carefully controlled. Then adhesive primer is sprayed on surfaces of B-52 parts that will be bonded; the phenolic bonding system used on the F-27 requires no primer.

Parts are joined in a large atmosphere-controlled room that also contributes to clean metal and good bonds. In fact, all parts are handled exclusively with disposable white cotton gloves that keep sweat acid and oils from the metal prior to bonding.

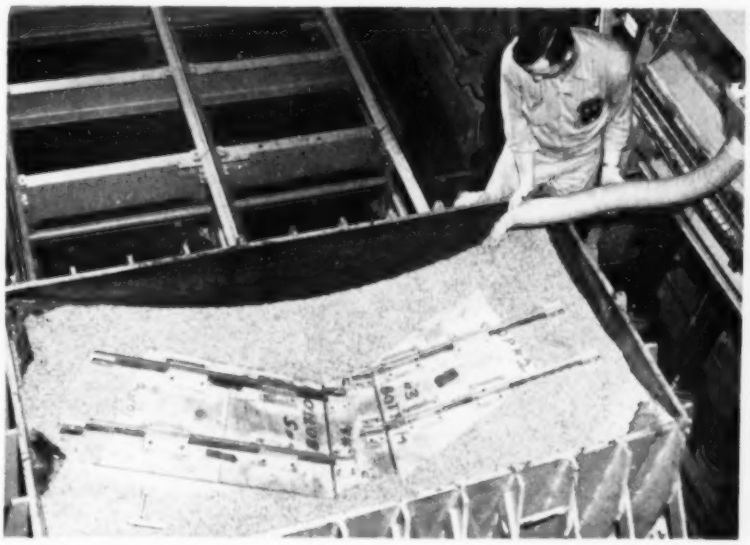
Phenolic (Redux) adhesive is applied in two stages to each surface to be bonded. First a varnish-like phenolic adhesive is painted on, then each surface is dipped in a trough of granular powder to pick up a layer of the powder portion of the adhesive. Parts are mounted together, and the assembly is held by quick-acting Cleco pins through the previously drilled locating holes.

Assemblies are moved to clamping fixtures where the pins are removed and tack rivets installed. These are small, flush-head rivets that hold small detail parts in the correct location during the actual bonding operations.

Panels made with honeycomb core cannot often be located the same way, with rivets, so fixtures are more complex. Honeycomb must be machined to exact size before assembly except that some exposed areas may be left oversize for milling cuts that may also clean off rib surfaces to critical dimensions.



B-52 panels are bonded . . .
in three-deck autoclave fixtures. Rectangles in door are hot-air channels; they line up with channels in fixture



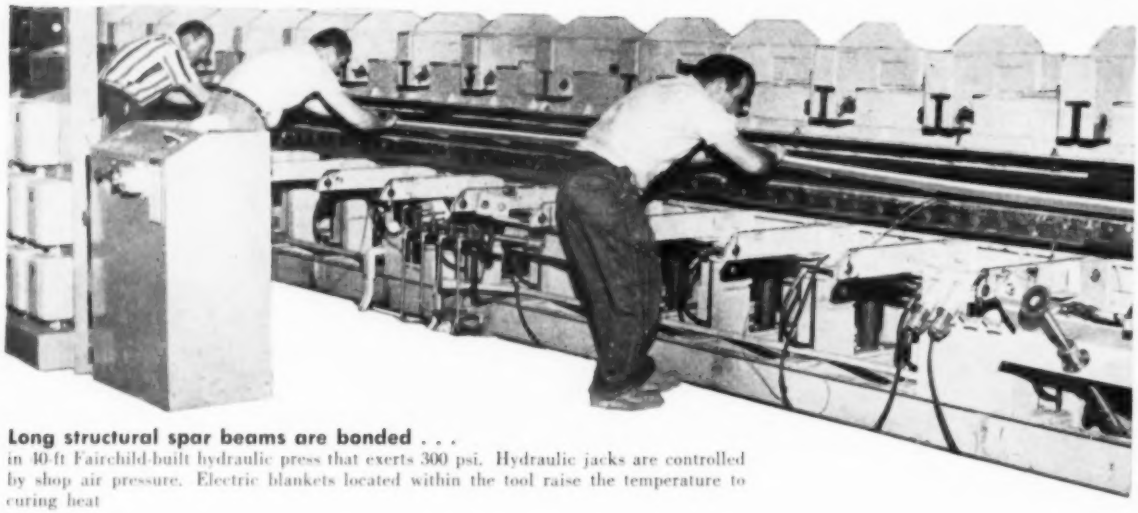
Redux bonds are cured . . .
in dished fixture at hydraulic press. Aluminum beads are loaded over clamped assemblies to distribute pressure. Heating is by superheated water circulated through table

Honeycomb trimming

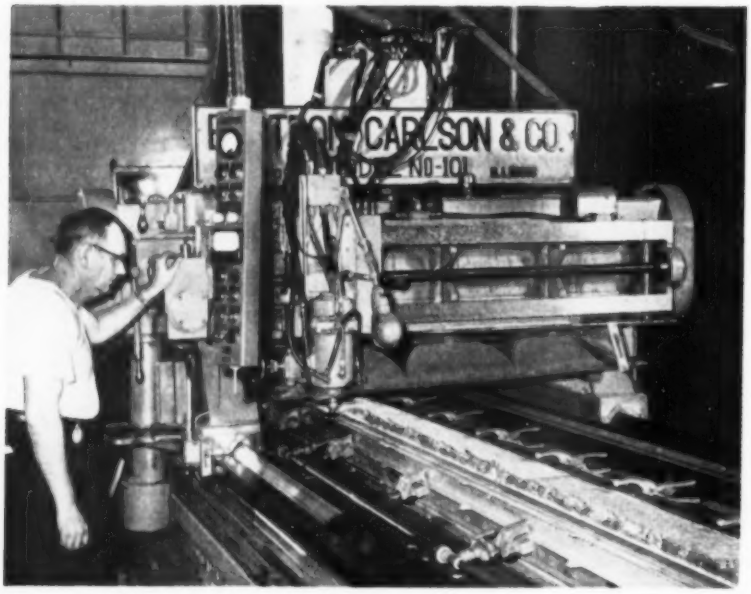
Honeycomb core is stocked in many cell sizes and many thicknesses. One of the simplest ways of trimming the periphery to a given size—usually to fill a cavity inside a panel—is to apply dinking (steel-rule) dies at a quick-acting platen press. The dies make clean cuts vertically, and can produce practically any outline desired. Dies are built up with a steel baseplate, steel-rule outlines deep enough to clear full stock depth, and welded braces on the outside edges. Rule is ground off at about 60° to provide sharp cutting edges. Stock is laid on top of a layer of resilient fiber at the press, then a die is set on top. The upper press platen is mechanically operated to make a quick stroke.

Honeycomb is cut to different levels—to clear internal braces, ribs, and doubler panels in the assembly—by a portable router with a valve-stem cutter. This uses high-speed—no teeth—to slice across the honeycomb cells.

Angled cuts across honeycomb, such as bevels around holes in panels, are made with a sabre saw or at a bandsaw fitted with a toothless blade—the "meat cutter." So far little compound contour machining has been done on honeycomb, although Fairchild has been successful in grinding single contours in straight-line elements with an abra-



Long structural spar beams are bonded . . .
in 40-ft Fairchild-built hydraulic press that exerts 300 psi. Hydraulic jacks are controlled by shop air pressure. Electric blankets located within the tool raise the temperature to curing heat



Honeycomb structures are milled . . .
with a valve-stem cutter to remove excess squeezed-out adhesive and extra stock where beams are contoured or tapered

sive-coated drum. However, most honeycomb machining has been confined to flat panels.

Honeycomb is bonded to the panel sheets and edge structure with both phenolic and epoxy resin in F-27 parts, and by the Boeing formulation in B-52 parts. The epoxy is a thick paste that is applied to thin gauze-like glass cloth with a "doctor blade" machine, but the Boeing adhesive is applied in sheets. The material comes sandwiched between protective film on two sides. Sheets are cut to fit the panel shapes, then the film is stripped away.

Honeycomb needs reinforcement at some points—particularly at corners. Extra strength is provided by foaming stabilized plastic, which is poured into the cells and which foams as it cures in a temperature-controlled oven. Excess foam must also be machined away. To get as clean a cut as possible, excess foam is cut along with intentionally excess honeycomb; and sometimes along with ribs or close-out members made wider than necessary.

Bonding

Three major bonding techniques are applied. B-52 parts are bonded in autoclaves where the assemblies are bagged in film, air is evacuated, and atmosphere pressure in the autoclave may be raised to any pressure necessary. Parts are installed on large tables fitted with hot-air passages. These connect up wth passages in the autoclave door when it is closed to route the air back and forth throughout the autoclave. Heat transfer is improved on the larger fixture tables by machined ribs that direct the air flow and provide more surface for heat transfer.

Large-area panels for the F-27 are bonded at a hydraulic press fitted with a unique system that distributes pressure to the work in spite of uneven contours. A large fixture that fits the transfer table for the press is built up like a well, with a bottom curved to an average shape for several large panels to be bonded. The work is tack-riveted together, then loaded in the well with its curved-face side matching the bottom of the fixture. Aluminum beads are poured over the work, then a heavy platen that closes off the well is loaded on top. The table is moved under the press, which applies pressure. The aluminum beads distribute pressure evenly over the work, acting much like a fluid.

Heat is applied by circulating superheated hot water through channels in the table. Cure takes less than an hour. This method assures

Steel-rule dies trim honeycomb . . .
to fit into structure cavities where it adds strength. Machine is a clicker press. One die member is required; it works against a resilient pad on the bed of the press

Valve-stem cutter . . .
on portable router cuts away small areas in sections through honeycomb cells. Recesses and tapers are created this way

high-quality bonding without the cost of matched tooling.

The third bonding method is for long, thin beams or spar caps that are built up by laminating strip stock together. Often these strips are V-bent down the center. They are joined with adhesive, then loaded onto the anvil of a long hydraulic press built in the shop. This looks much like a press brake, but it only exerts pressing force from hydraulic jacks. Electric blankets loaded into the press jaws are in direct contact with the work, and these are fitted with thermocouples to lead signals to a control panel where temperature and pressure are regulated, along with time.

Bonds must be checked closely, as with any other structural joints for aircraft. One check is made with samples that are fabricated and covered with adhesive at the same time as the work in progress. These are bonded at a smaller hydraulic press under the same cyclic conditions (which are charted) as those intended for the work. The samples are destructively tested before the actual run is made; any flaw in the process can be detected prior to actual production bonding. This method checks adhesive mixture, pressure, temperature, and time cycles.

Peel and lap-shear tests are made on the metal-to-metal bonded samples to provide recorded data that may lead to slight changes in bonding cycles. Larger or complicated honeycomb assemblies are inspected by x-ray and fluoroscope to determine quality of the bond and extent of foam filling in the reinforced areas.

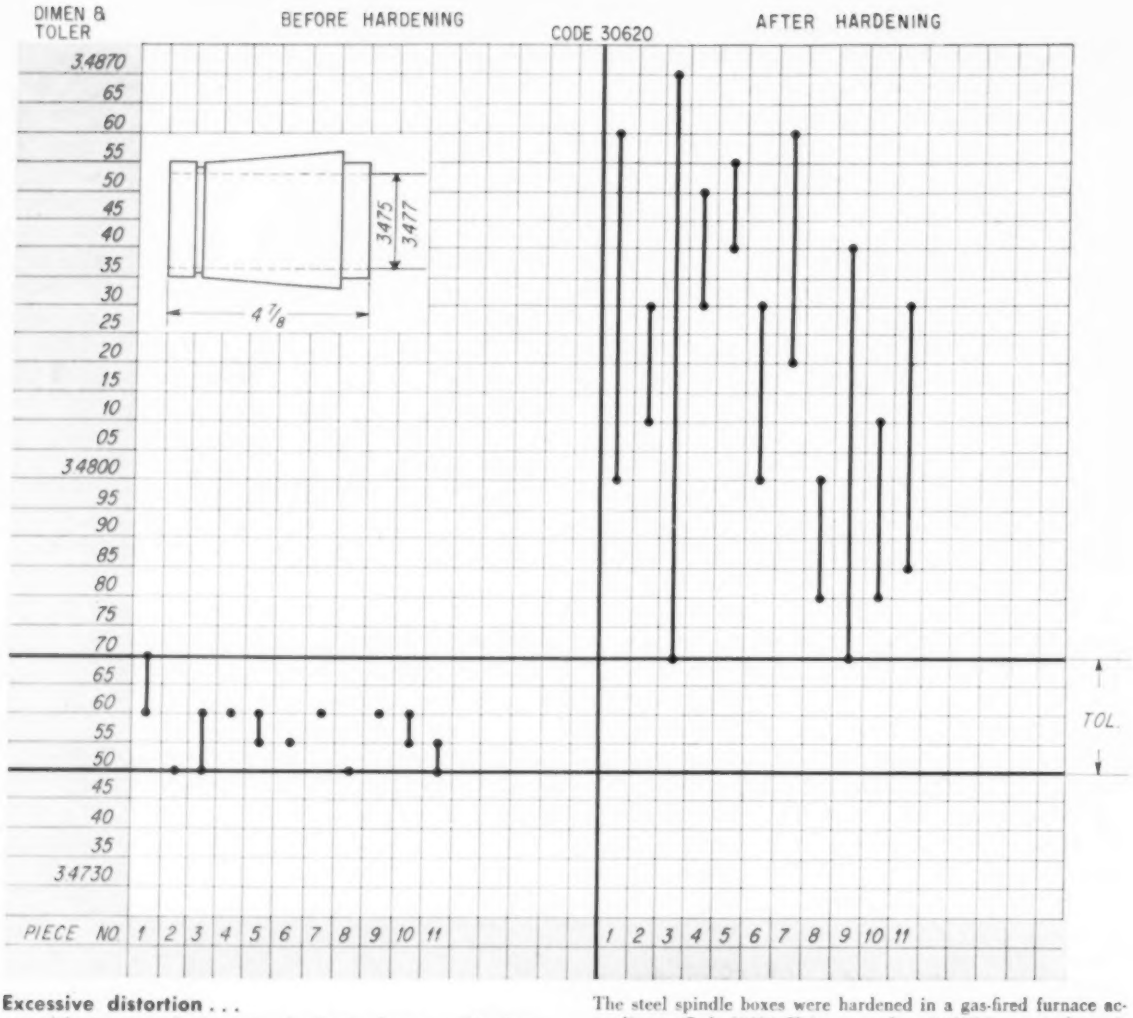
Foam plastic adds strength . . .
at corners and critical sections where honeycomb needs beefing up. Excess foam will be machined away with excess metal—to provide a smooth finish

Beam construction

The laminated spar beams are milled to contour after being bonded, and may even be formed. Each lamination goes through much less distortion and strain in a given bend than would a single solid section of stock the full thickness of the laminated beam; thus the metal runs much less chance of being fatigued or strained beyond elastic limit.

All bonded joints must squeeze out some adhesive, just to prove there are no void areas inside. These lines of excess bond may be left unless they will show in the aircraft or unless the edge must be machined to match another panel or structural member.

Assembled bonded panels are joined to the airframe structure with rivets, but the only rivets in the panels themselves are the assembly-locating rivets.



Excessive distortion . . . caused by improper heat treating is clearly shown on this chart of hole size and out-of-roundness, before and after hardening. The steel spindle boxes were hardened in a gas-fired furnace according to Code 30620. Holes opened up 0.0065 in.; out-of-roundness increased from 0-0.001 in. to 0.0015-0.010 in.

Heat-treating control cuts reject rate

By Neil B MacLaren, director of quality control
Machine Tool Div, Brown & Sharpe Mfg Co, Providence, RI

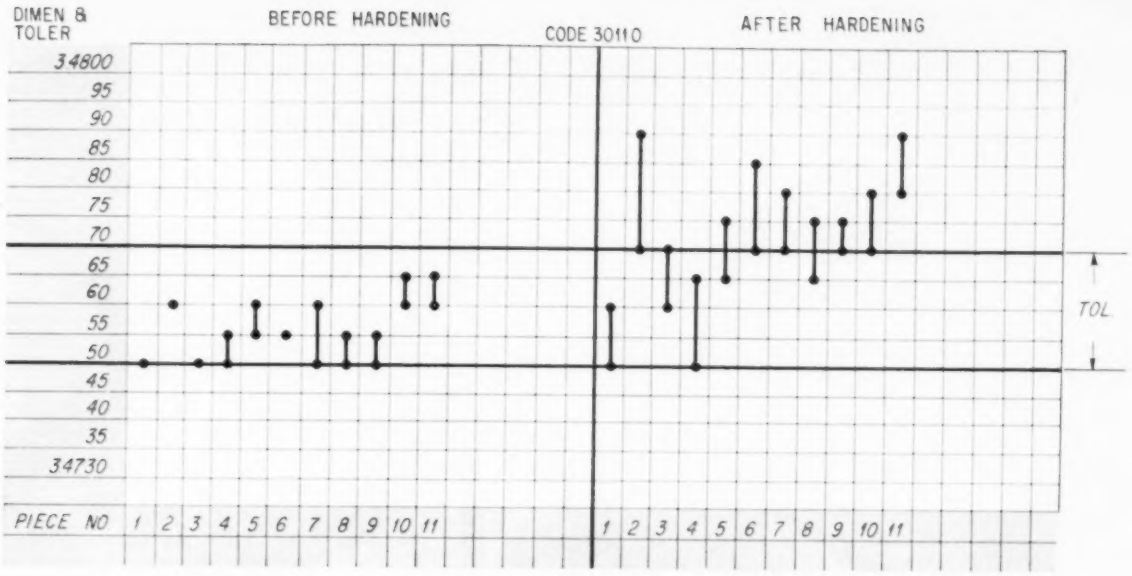
All steels distort when heat treated. Unfortunate, but true. But this distortion can be controlled if you carefully select the type of steel and the heat treatment best suited to your particular needs. Applying quality-control analysis techniques to years of accumulated heat treating data, Brown & Sharpe has compiled a Heat Treatment Code Book that greatly simplifies this selection problem. Already it has cut our heat-treat defects by two-thirds.

Checking into the cause of defective steel parts, we first focused our attention on the machining operations, but soon found that a large percentage of the defectives could be traced back to the heat-treating operation. By heat-treat defectives we mean distorted parts that require excessive rework or must be scrapped.

Thereupon, our Quality Control Department in cooperation with the Heat-treating and Metallurgical Departments designed and performed hundreds of closely controlled tests on the deformation of individual steels when formed to various shapes and subjected to many different heat treatments.

Results of the tests were presented on simple charts, two of which are illustrated here. These charts show what can be done simply by using a different hardening method. For both tests eleven parts were picked from a lot of 100, numbered, measured, then hardened and remeasured. In the first test hardening was done in a gas-fired furnace and resulted in excessive hole growth and increased out-of-roundness. When hardening was done in a salt bath (top, p139) there was a marked reduction in distortion. Obviously, for this steel and this part, the salt bath treatment was the superior process.

Several other charts were used in presenting the test results; one of the most useful was the histogram, a



Distortion is greatly reduced . . .
by hardening the boxes according to Code 30110, a salt bath treatment. Holes opened up only 0.0016 in.; out-of-roundness never exceeded 0.002 in. Tests such as these stand behind the recommendations in Brown & Sharpe's Heat Treatment Code Book

1st DIGIT TREATMENT		2nd DIGIT CARBURIZING METHOD		3rd DIGIT HEATING OR REHEATING METHOD		4th DIGIT QUENCH		5th DIGIT DEPTH OF CASE	
0		0	Not Carb.	0	Not Re-Heated	0	Not Quenched	0	No Case
1	Case Harden	1	Cyanide	1	Neutral Salt	1	Hot Salt	1	.002 – .004
2	Selective Case Harden	2	Pack Carb. 1460°F	2	Cyanide	2	Oil	2	.005 – .007
3	Harden	3	Ajax Salt Bath	3	Lead Pot or Gas Flame	3	Water or Brine	3	.009 – .012
4	Selective Hardening	4	Pack Carb. 1600°F	4	Induction Heater	4		4	.013 – .020
5		5	Home Carb Carburized	5	Flame Harden	5		5	.025 – .035
6		6		6	Gas Furnace	6		6	.040 or over
7		7		7	Home Carb Furnace	7		7	

Hardening code . . .
makes use of a five-digit figure. Code 30110 calls for a hardening treatment, without carburizing, in which the parts are to be heated in a neutral salt bath then quenched in hot salt

graphical representation of the frequency distribution.

Equipped with these test results, we were in a much better position to attack our problem. Now, we could see what would happen if we changed the type of steel, the hardening method, the manufacturing process, or the machining tolerances.

Fine. But how could we pass this information, several years' worth of data, to our engineers, planners and heat treaters? We decided to publish a Heat Treatment Code Book, a book that would assist the engineer in selecting steels, aid the planner in processing the job, and guide the heat treater in choosing a treatment.

Aside from the hardening code chart and the specific code details (both illustrated here), the book presents data on steels, giving classification, cost, machinability, color marking, applications, chemical analysis and hardening data.

CODE 30110

HEAT TREATMENT: Neutral Salt Hardening.
Heat through in Neutral Salt at 1450°F to 1575°F. Hot Salt Quench at 400°F. Temper to desired hardness.

HARDNESS: Depends on steel used.

PARTS HARDENED BY THIS METHOD: Gears, clutches, shafts, bushings, etc.

STEELS HARDENED BY THIS METHOD: B&S #16, 20, 30, 35, 64, 67, 84, 8650, 9442, & 6150.
With B&S #30, it is necessary to heat pieces in carburizing bath to prevent decarburization.

FINISH: Grayish black finish, good appearance, free from scale.

DIMENSIONAL CHANGE:
Holes: Holes Open. Threaded holes need not be sized oversize. Dowel holes or other small holes open slightly but not enough to cause loose pins or holes not cleaning out in honing operation.
Larger holes open up but not enough to cause difficulty in cleaning out at grinding, when our standard stock allowance is used. Pieces that are first rough ground, leaving .006-.007 or .008-.009 surplus, before hardening will in some massive pieces cause some trouble cleaning out at grinding. However, only a few exceptions have not cleaned out.

Outside Diameter: Slight shrinkage.

Runout: Most jobs require no straightening.

Out-of-Roundness: Out-of-roundness is controlled to close tolerances. Thin cross-sectioned pieces and intricate parts can be held to minimum out-of-roundness.

SUMMARY: At present, neutral salt hardening is our most successful treatment to minimize hardening distortion, where it is necessary to harden a part all over. Intricate parts with varying cross-section can be successfully hardened within acceptable tolerances.

Coded hardening treatment . . .
is spelled out in detail. Each treatment is fully explained, pointing out the kind of parts best suited to treatment, steels that respond to treatment, and the distortion that can be expected

Four dispatch centers, like this, control the flow of production orders for 150 work centers. Tickets in the upper tiers represent orders now in the plant but not yet under control of the center. Middle row contains orders under control. Lower section holds cards for work in process

Sorted records integrate production schedules

By Leo A McPherson, Columbus, Ohio

Processing more than 1500 orders per day, with no two orders exactly alike, was a sizable headache for Fairfield Manufacturing Co, Lafayette, Indiana gear manufacturer. Eighteen months ago the company put in a new production control system. Today, management knows what is happening in any department; can spot the scheduled load for any operation a month, three months or six months away. Status of any order is immediately available—without calling the manufacturing people concerned.

"Of course we had a production control system," says C E Kramer, Fairfield's chief industrial engineer, "but it depended upon the phenomenal memories of several key people.

"It was not uncommon to see a group gathered around a tub of semi-finished parts—all contributing their recollections to try to identify the order. While all castings, for example, are stamped or otherwise labeled, a simple grinding operation will easily remove the identification."

Now, a new system protects each order against loss of identification. The guessing and memory contests are over. But this is only one of many benefits. Sound scheduling

provides not only the expected advantages of smoother machine loading and more accurate delivery promises, it also permits many customer services.

Reliable scheduling also returns a direct profit by reducing the inventories normally needed to backstop poorly integrated production and ill-timed shortages.

Secret of Fairfield's improved situation rests with that one word—*integrated* control. It starts, of course, with the customer's order. A multiple-part master sales-order set (carrying all then known data) is prepared and distributed to Production Control, Purchasing, Manufacturing, Engineering, Metallurgy, Accounting and Sales.

Break down the order

Action on all fronts starts with receipt of the order form. Engineering, for instance, prepares a Bill-of-Materials in collaboration with Purchasing. The latter then extracts its own list of parts to be purchased and determines delivery dates for raw materials in relation to production cycles. Engineering may order changes in specifications as a result of previous conferences with the customer.

Metallurgy will check heat specifications and will order changes if specifications differ from those for previous orders. Production Control determines the number of man-hours needed, and available, to fill the order. Manufacturing decides what tooling is required.

Forms which control shop operations are created simultaneously and kept in a file envelope preparatory to scheduling. Most forms are Royal-McBee Keysort punched cards, used to sort the mass of data into basic reports—such as load scheduling, scrap and reject, etc. These cards also serve to write Fairfield's shop payroll, with its complexities caused by an incentive arrangement.

When a job is up for scheduling, forms are distributed. Distribution takes place about five days prior to the first labor operation. Release for production results from the information on hand, from all responsible departments, in Production Control —a product of the system.

Nerve centers are four dispatch areas, servicing the approximately 150 work centers. These centers receive Keysort load tickets and labor distribution tickets prepared in the anticipated quantities. Labor tickets are filed by job number at the dispatch centers. Load tickets are filed (by work center) in three step-files. The upper tier is for the newly arrived and unassigned jobs. They will stay there until semi-finished pieces move into the control of the dispatch center in question.

Readiness is signaled by the delivery to the dispatch center of the Keysort move ticket, which is notification that one labor operation has been completed—and a trucker has physically moved the pieces.

Load tickets will then move down to the next tier as visual evidence of work on the floor, by work centers. Foremen and dispatchers work cooperatively to expedite orders in relation to delivery dates.

When an operator finishes a job, his foreman hands him an identification ticket, which always physically stays with the work in process. The operator takes it to the dispatcher who selects a corresponding labor ticket from the files, stamps it to show starting time, and notches its margin with the operator's clock number. The load ticket now moves down to the bottom tier as evidence of work in process.

From the load tickets is Keysorted a monthly load report as to backlog, work scheduled and work in process. An intermediate, but less complete, report is taken every other week.

Mr. Kramer says: "The advantages of these load reports are so many it is difficult to know how to rate them. Not only that, but as we live with this system we are sure we are just beginning to see all its possibilities. For instance the system offers a clear look ahead. A few hours' overtime ordered in a key department tonight can prevent several days' layoff in other departments thirty days from now."

Better scrap control

In the past, pieces rejected and ordered reworked through certain labor operations often got lost. A "short" of 40 pieces can be serious.

Now, a Keysort scrap rework and reject ticket is created. If reprocessing is necessary the proper departments are notified. Nor will the reject pieces be pushed aside as in the past. An unidentified tub of pieces can be ignored but not a production ticket!

Furthermore, a management decision can be made. Should the balance of the order flow through operations? Will the customer take partial shipment, accept the reprocessed pieces later? The facts are on hand to make good decisions . . . but that reject ticket demands a decision.

Fairfield figures a potential 5% on scrap and reject, and so initially orders that excess on raw material and castings. Often performance is better than this figure, and usually the customer can use such overage. Numerical count is important to customers, and to machine loading.

It's possible, too, to accept an increase in an order, put the addition on somewhat of an "express" schedule to catch up in labor operations . . . and deliver the order as a unit. Similarly, Fairfield can accurately and quickly delay production, to cooperate with a customer's changing production needs. Thus, Fairfield's customers can "play it close to the vest" on inventory.

Setups, of course, constitute a major direct-labor cost on any job. Fairfield has been able to reduce setups as another result of its system. A setup ticket provides the historical data to permit this improvement.

The production record is the Keysort master-order ticket. When a job is finished this record bears a history of everything that happened, a ready reference for research.

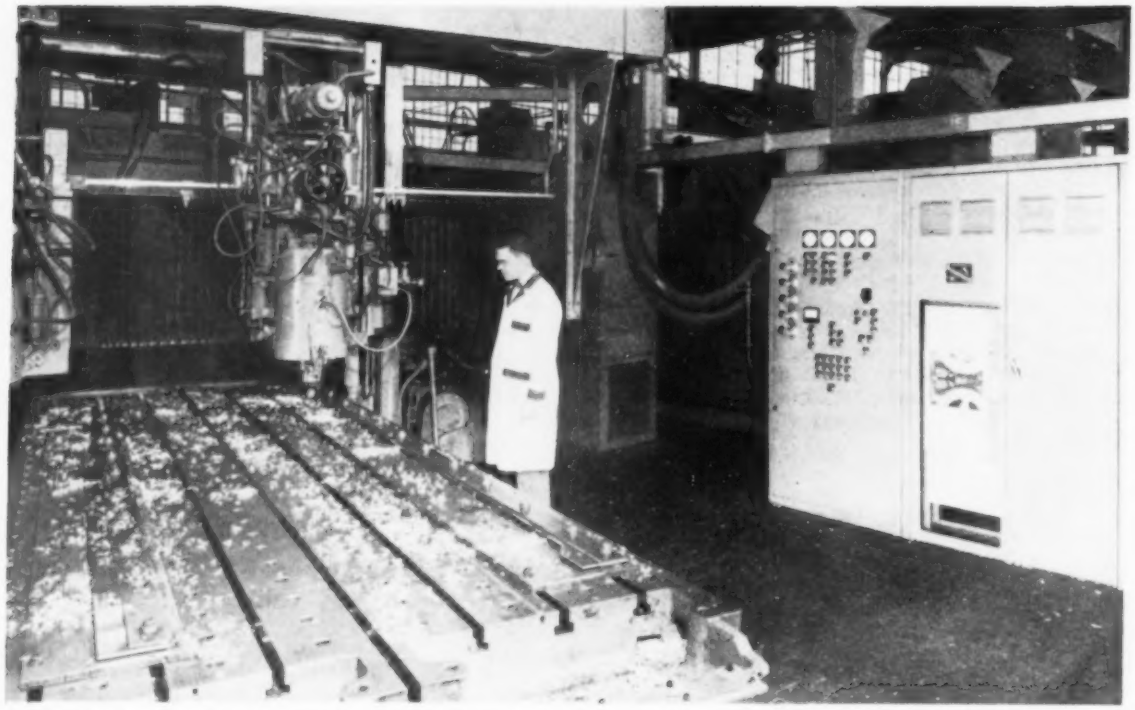
Daniel Siegrist, assistant treasurer, sees possibilities of analyzing markets by size, detecting trends as to type of gears, spotting planning going on in research and engineering departments of customers.

Trends towards the use of new metals, and the almost positive certainty of others to come, is a case in point. This could necessitate complete revamping of heat treatment facilities. Fairfield hopes to be ahead of the parade, have the needed equipment on order before the demand is overwhelming.

Introduce system slowly

How does an organization launch a new production control system? Is it done overnight? Fairfield decided against such radical installation. "We held a series of departmental meetings," Mr Kramer says, "and explained the whole complex problem to all our employees. We asked for suggestions . . . and were offered some good ones. Thus in a sense we made partners of the people who would use the system. For no system will work without this cooperation."

Fairfield then introduced its new system in one dispatch center, covering a number of contiguous and related labor operations. Gradually it gathered fans among Fairfield people, its reputation for efficiency grew beyond the departments using it. When the time came to launch it on a plant-wide basis, the organization was prepared.



Duplicate clamping fixtures are mounted along opposite sides of the machine table. Then the 12-ft-long blanks are clamped in position for profiling. Relatively slow table speed permits reloading one fixture while a cut is in progress on the other

Errors are rare... Duplication is simple, as... Capacity is broadened... Production is higher...

Tape control cuts cam cost in half

By **Fred Burdett**, engineer G & L and Hypro Division
Giddings & Lewis Machine Tool Company, Fond du Lac, Wisconsin

More than 25,000 ft of aluminum-alloy control cams for a spar miller have been machined for Boeing Airplane Co at the Giddings & Lewis plant in Fond du Lac, Wis, as a production test. Part of our continuing investigation of the economies of using the G & L Numericord magnetic tape-controlled, planer-miller for a wide range of machining operations, the job also proved profitable.

In these tests, the 6 x 14-ft-table machine is considerably larger than ordinarily would be used to profile the cam sections. Total time required per cam section, however, including time for preparation of the control tapes, is less than one-half that required for machining and finishing the sections with conventional methods.

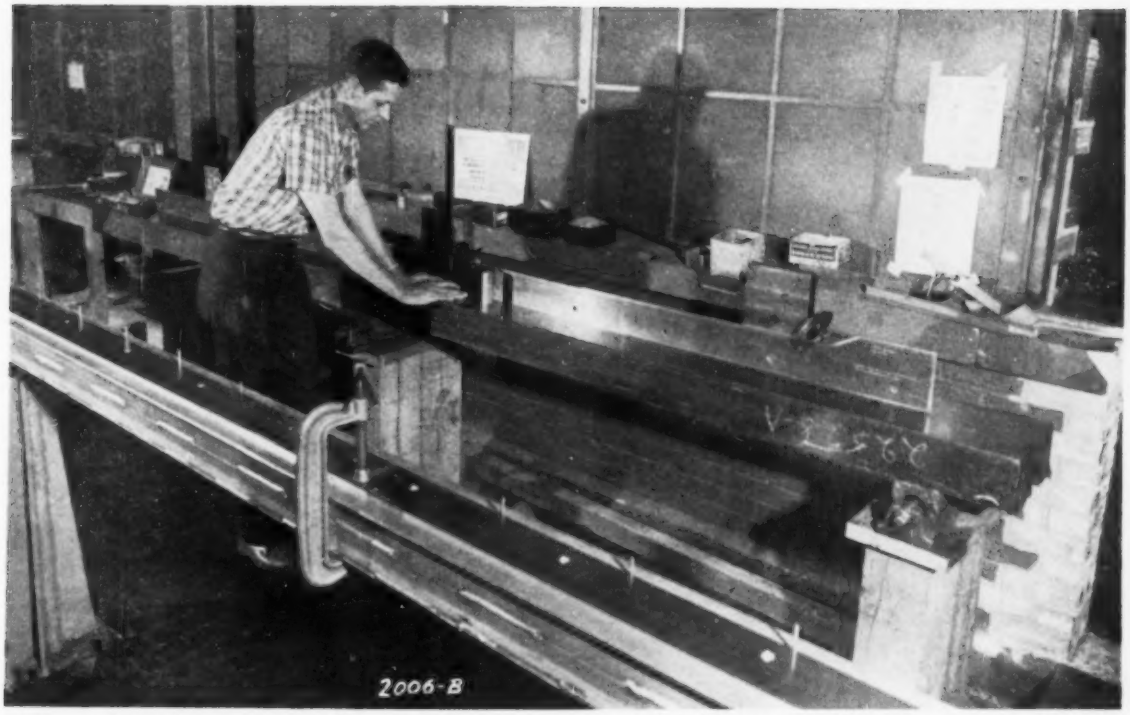
In fact, the contract for this work was obtained by competitive bidding and our price was only 40% of the nearest competitive bid, yet we are able to realize a modest profit.

To control a large Onsrud spar miller (installed at the Boeing plant in Wichita) that machines B-52-G bomber wing sections, these profile cams are 84 ft long. They are machined in 12-ft-long sections from strips of 20-24ST-4 aluminum-alloy plate, then mounted end to end.

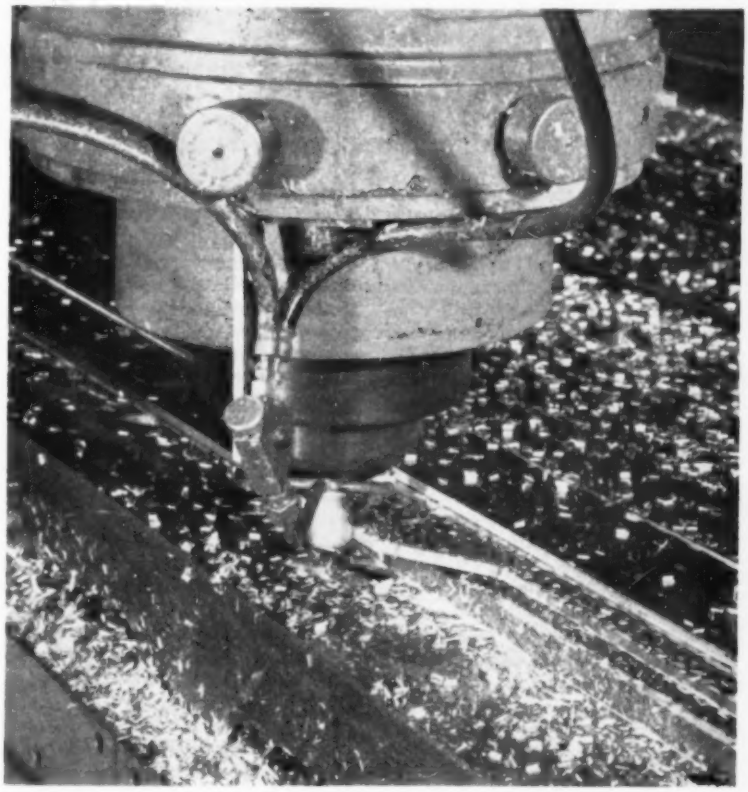
Blanks are 6-in.-wide strips sawed from ¼-in.-thick commercial mill plates. Best results are obtained with stretcher-leveled stock.

Specified tolerances for dimensions and surface finish are somewhat tight for this size of work. Assembled 84-ft-long cams, made up of seven 12-ft long sections butted end-to-end, must be held within plus or minus 0.010 in. over their entire length when checked with Boeing gages. Profile height must be held within plus or minus 0.001 in. In addition, cam profile surfaces must match at all joints between the individual sections, and these surfaces can be no rougher than 30 to 40 mu-in.

Magnetic tapes to control the table and the cutter spindle for the different cam profiles were prepared, as previously described (*AM*—Nov 4 '57, p145), with an IBM 650 computer and G & L Numericord director routines. Cuts are taken with either the 50- or the 100-hp spindle



To insure close tolerances, both C & L and Boeing inspectors check each 12-ft-long cam section. Profile is held well within ±0.001 in. tolerance. Assembled cams are checked in pedestal-mounted, 85-ft-long precision fixture (foreground), with Boeing-made gages, to a tolerance of ±0.010 in. for the overall length



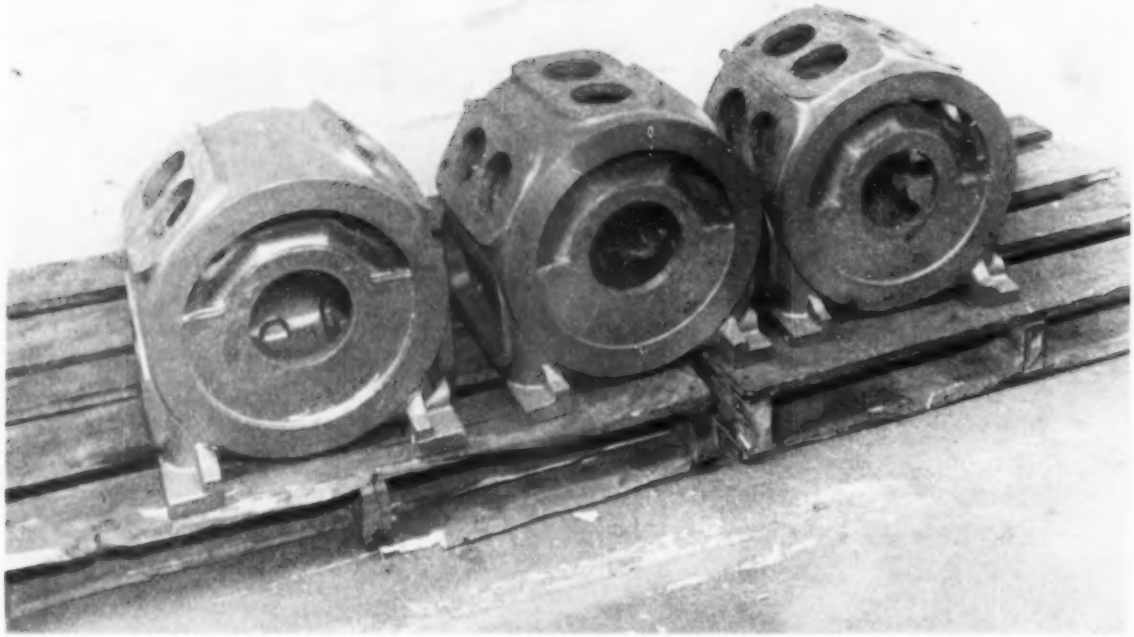
Mist-cooling system applies coolant in the cutter-work area. Cam profile is roughed at 60 ipm feed. Water-cooled motor on spindle drives cutter at 3600 rpm

head on the machine, with each cut drawing less than 5 hp.

With 1- and 2-in. OD HSS endmills, ground on the periphery for clean cuts in the aluminum alloy, rotated at 3600 rpm, feed rates are 60 ipm for milling back and end surfaces, and for roughing the cam profile, and 30-ipm for the finishing cut on the cam profile.

Two simple locating and clamping fixtures were set up on the machine, one along each side of the table, so one fixture could be unloaded and reloaded while the blank in the other fixture was being rough and finish machined automatically.

Had duplicate cams been included in the order, additional economies could have been gained by stacking blanks in the fixtures to a maximum thickness of 3 in., machining 12 at once.



Different parts in low quantities . . .
are machined automatically in the same special machines. These crankcase housings are rough and finish bored and milled in lots of 50 pieces on automatic equipment that cost considerably less than that of conventional machines

Automation works in the small shop too!

By Ralph E Cross, Executive vice president, The Cross Co, Detroit

"What good will automation do me?" That's a question every manufacturer, regardless of the size of his shop, must one day ask himself. Trouble is, too many owners of small, low-volume shops don't bother to ask it. Their attitude: automation is for the big boys.

But is this really so? True, much attention is focused today on the extnesively automated plants of the country's leading mass producers, such as those of autodom's Big Three, whose installations run into millions of dollars. Obviously such automated setups are not only out of reach of the small shop, they are economically impractical for low-volume metalworking production.

But the principles employed in such big setups are just as useful in automating a single machine, or a line, as they are in automating a whole plant. And these same principles are vital to the survival of any manufacturer up against vigorous day-to-day competition. The manufacturer who persists in pitting horse-and-buggy methods against those of a competitor who employs every modern technique to get manufacturing costs down is committing economic suicide.

Automation offers several basic advantages that apply equally to a block-long production line or to one machine. Among them it:

- Reduces manufacturing costs
- Improves product quality
- Conserves valuable floor space
- Increases safety
- Conserves manpower

Any one of these advantages could make automation for the small shop worthwhile. But it's hard to achieve one of these advantages without several or all of the others falling into line, too.

Let's look at automation's advantages one by one. First, manufacturing costs—traditionally the production man's No. 1 challenge. **Manufacturing cost reduction is almost a built-in factor in automation: production rates are faster, rejects are fewer, and labor costs are lower.**

Product quality is another built-in automation factor, simply because most automated equipment will not accept out-of-tolerance parts to begin with. Moreover, because automatic equipment handles each part in exactly the same way, uniform quality is inevitable once a desired standard of performance has been established.

Conservation of floor space is readily achieved with automation's compact machines, which are designed to perform a number of automatic operations in the smallest possible space. Compare this with a line of standard machines—usually spread out to provide room for manual or automatic between-machine handling.

Safety is greatly increased by automation in that it eliminates (1)

accidents incurred in manual lifting of heavy parts in and out of machines, (2) minor injuries such as cut hands and fingers incurred while handling machined parts with heavy burrs, and (3) serious accidents caused by broken tools. In addition to purely human safety considerations, lost production time, high accident insurance rates, and other economic factors of safety must be considered when comparing manual and automatic operations.

Conservation of skilled manpower is one of the most important advantages automation has to offer. This is especially important in low-volume shops, where individual worker effort has a strong influence on the profit or loss sustained on a job. With automation, better use is made of personnel who might otherwise devote a large part of their time to loading, handling and other unproductive manual operations. Frequently, small plants automate for just one reason—to increase output per man to acceptable levels.

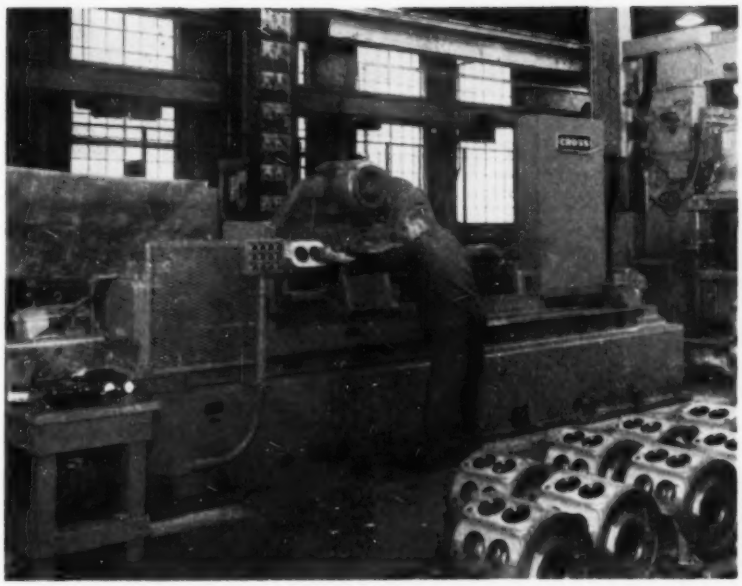
All of this sounds good, but you can't get it just by spending a lot of money for automated equipment. The first and most important step is to plan carefully—what suits one plant may be useless to another. Automation in any degree is essentially a matter of individual requirement, and the extent to which it is applied depends largely upon such factors as available capital, present and proposed equipment and capacities, production volume, design life of the product operations to be performed, available personnel, and plant size.

Partial automation works too

Remember, it is not necessary to automate a process 100% to obtain good returns. Frequently, automating part of a process (say 80 or 90%) will effect substantial savings in manufacturing costs, whereas trying to automate the remaining 10 or 20% of an operation may make the whole idea too expensive to consider.

In planning for automation, a comparison should be made between current and proposed methods to determine (1) what processing improvements can be made, and (2) what existing equipment can be used in the new setup, if any. Also, the product itself should be analyzed, i.e, can the design be modified to facilitate automatic processing?

Of course, long design life is a tremendous advantage even where quantity requirements are low. But long design life is not necessarily a prerequisite to automated processing. For this reason, production scheduling is especially important in automating low-volume production.



A two-way setup . . .
is the first of the two special machines that automatically bore and mill crankcase housings. Work is loaded manually into this one after the support feet have been milled for locating purposes. Roughing and finishing main crank bores, the thrust faces, and the stator mounting flange are the operations performed here on a variety of housings of different sizes

A supply of parts sufficient for a month or so can be run off very quickly—but quantity should be governed by the value of such work in process. In a great many cases, low volume automation is justified solely by savings gained with reduced inventories. Low-volume automation 90% of the time is most practical if geared closely to sales requirements.

Initial investment does not always indicate the final cost of an automated installation. The best setup is determined by comparing the results of several proposals over a period of of about one year. Each proposed plan of automation should take into account such factors as sales income, material costs, labor costs, factory expenses, administrative expenses, interest, and taxes.

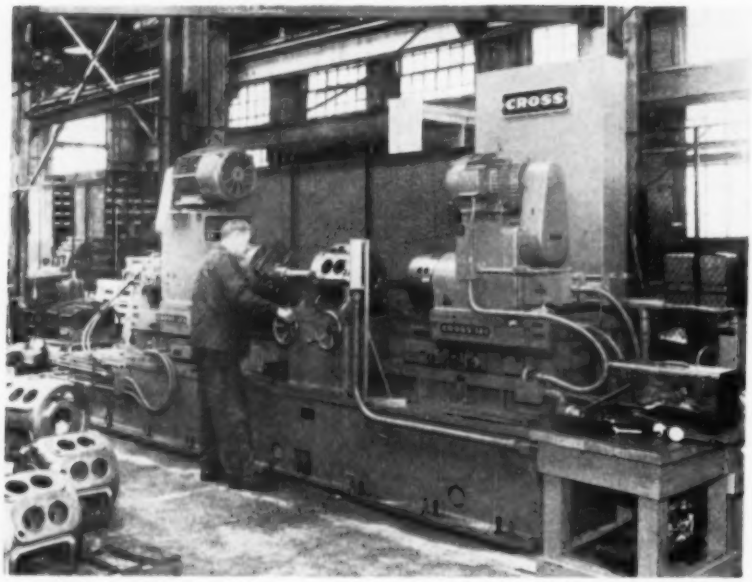
Key to automating low-volume production lies in the versatility of the equipment, which should be able to process several different parts, and even perform operations other than those for which it was originally installed.

Development of standard components (main bases, wing bases, columns, feed units, and other basic parts that can be rearranged, removed, or added to a setup) provides a high degree of flexibility when product design changes occur, or when it is necessary to revise processing.

High-capacity automated machines have often been called upon to handle low-volume production of more than one part. Such equipment is made up largely of standard units, with special heads and other components added to suit a particular job. For instance, a two-machine installation built for a pump manufacturer automatically rough and finish mills, and bores and faces four different crankcase housings for 4, 6, 8, and 10-cylinder compressors. The machines are sufficiently flexible to allow for future design changes in crankcase housings. Soon they will be called upon to machine a stator —an entirely different part.

Production runs in this instance are based on sales requirements. Each type of crankcase housing is usually rough and finish machined in lots of 50 pieces. Processing starts with rough machining in the two special machines. Then cylinder heads are drilled, and mounting holes produced in a separate drilling setup. Finish machining is done when parts return to the automated machines.

First in this in-line setup is a two-way machine for boring the main crank bore and facing the thrust, and stator-mounting flange faces. This one has a special base, a part-mount-



Special-design features . . .
were incorporated in the second special machine, an automatic shuttle type, to provide the high degree of flexibility needed for processing different parts on a low-volume basis. Unit construction was employed in building both machines

ing table, an equalizing clamping fixture, and two standard feed units, each with special heads. Operations performed here are the same for all crankcases regardless of size. Slight differences in part length are handled by adjusting the stroke length of the two boring and facing heads. Where there are significant differences in part length, one of these heads and its saddle can be moved back without removing it from the machine. Latitude in stroke length allows for processing of considerably larger parts without moving the head, which is designed for regular changes in stroke between roughing and finishing cycles.

This exceptional latitude is needed because finish machining of main crank bores is done by this head alone—although roughing is performed simultaneously by both heads.

Finish boring is accomplished with a long quill, which extends from the head through the part to the opposite bore. Upon completion of the opposite bore, the quill retracts partially so it can finish the near bore. For maximum precision, thrust and flange faces are machined after the crank bore operation.

The second machine, a shuttle unit for face milling and cylinder boring, also combines standard and special components. A special two-spindle boring head is mounted on a standard feed unit and wing base. An identical base supports a special, single-spindle milling head. The main base, shuttle, tail and head-stock fixture, and adapter plates are special, too. From two to four automatic shuttles and boring cycles are provided, as is automatic part indexing, transfer, and locating.

Depending upon the specific crankcase model, the number of bank faces to be milled range from two to five, while the cylinder bores to be bored and counterbored range, of course, from four to ten. In addition to these differences, each pair of cylinder bores is offset from the stator mounting flange face in varying lengths to allow for connecting rod clearance.

Center distances between bores vary with different models. Consequently, it is necessary to provide the machine with positive mechanical means of presenting each bank face and each pair of cylinder bores automatically to the milling and boring heads in turn. Of course, each pair of cylinder bores must be positioned differently in the boring head in successive shuttle cycles.

A special indexing fixture on the headstock positions the bank faces and cylinder bores on the same horizontal and vertical axes relative to the milling and boring cutters. For varying center distances between the cylinder bores, each spindle and head is of standard unit design. In this way, distances between spindles can be increased or decreased with spacers.

All tooling on both machines is changed by the operator between the rough and finish cycle. All machine adjustments (including length of stroke and depth dimensions on the shuttle-machine milling head) are made while tools are being changed. However, cycling of each machine is staggered to permit changes on one while the other is running.

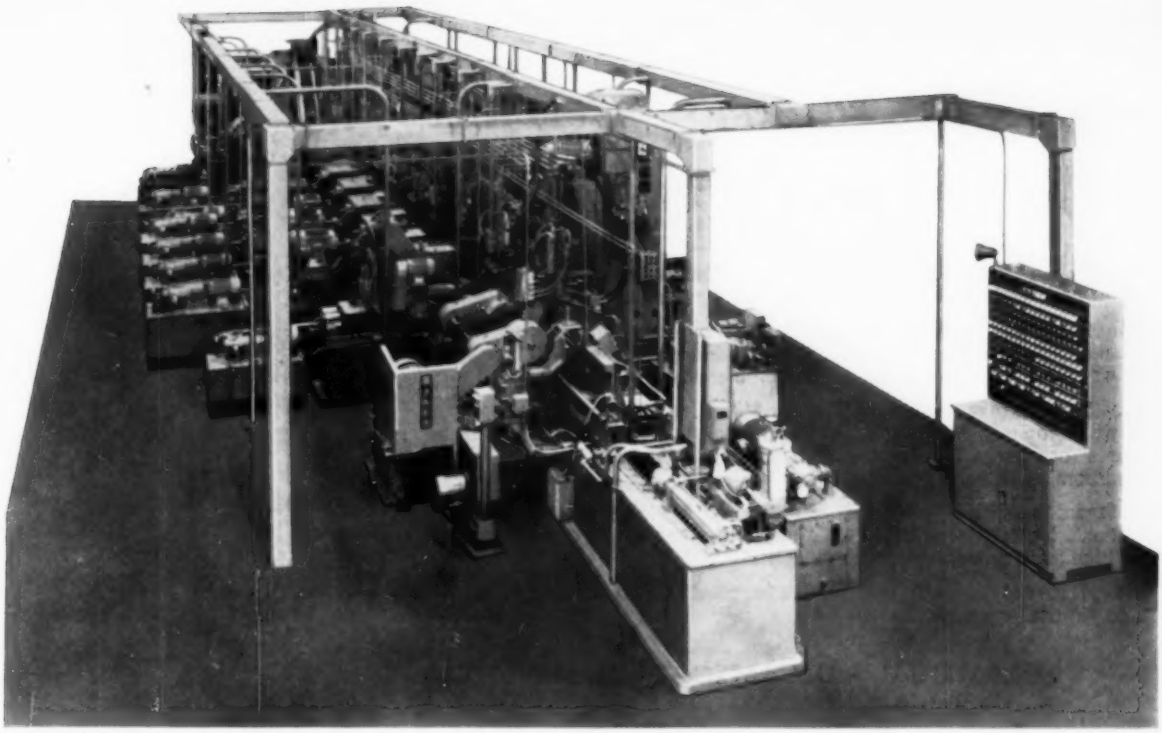
Total cost of the two machines, including installation, was considerably less than was estimated for the conventional automatic lathes, milling, and boring machines that would have been required to perform identical operations.

One machine does work of four

In another instance, an automated boring machine built to do the work of four conventional machines not only cut down on initial costs, but on yearly operating costs. The special machine cost slightly under $90,000, compared with nearly $250,000 for the four conventional machines. Yearly operating cost of four horizontal boring mills on a two-shift, eight-man, 40-hours-a-week, 50-weeks-a year schedule would be $40,000. Cost of operating the special machine (with only two men) on the same schedule was $10,000.

Similar gains were made with a pallet-type transfer machine developed for boring, hollow milling, and trepanning military tank idler arms. Eight vertical lathes to do the same job would have cost $440,000, whereas the special machine cost only about $220,000—or half this amount. Yearly operating cost of turret lathes (16 men on a two-shift basis, 40 hours a week, 50 weeks a year) would be about $80,000. Four men on the same schedule run the automated setup at a yearly cost of $20,000.

Another relatively low-volume operation involving boring, facing, and drilling truck axle housings—was handled in much the same way. An automated machine was installed at a cost of about $320,000. Seven conventional machines to do the same job were quoted at nearly $400,000. Operating cost of the latter (with 10 men on two shifts, 40 hours a week, 50 weeks a year) would have been $50,000. Only four men were needed to operate the special machine on the same basis, and its annual operating cost was $20,000.



drilling...boring...grinding...facing...sawing...

AND INTO THE BINS

A large automotive manufacturer is using this completely automated BAKER transfer line for machining bearing caps for 12-cylinder truck engines. At a production rate of 70 parts per hour at 100%, this 21-station line machines the parts and finally separates the individual caps for delivery to their respective bins. Phone jacks allow the operator to instantly contact any station.

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LEFT: Bearing caps cast in one cluster. RIGHT: Seven bearing caps after machining and separating. This special BAKER transfer machine also handles similar parts for 6-cylinder engines.

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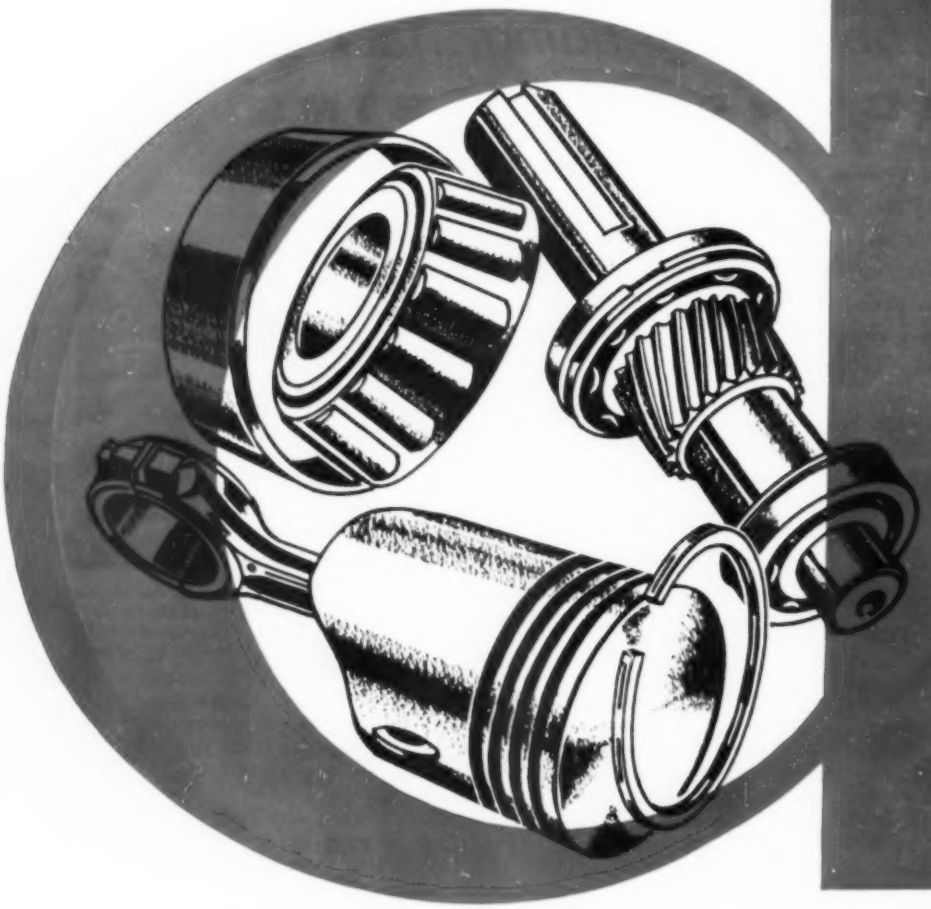

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REFERENCE BOOK SHEET

Blank Diameters of Drawn Shells—I

By Ronald Wakelee

Here is a graphical method that saves up to 50% of the time often required to find the blank diameter for a drawn cylindrical shell. Certainly, much time is saved by this method as compared to breaking down the shell into segments —circles, cylinders, spherical sections, etc—and totaling their areas. The latter procedure is now common practice, and was described by me over 30 years ago in an article "Methods of Finding Blank Diameter of Drawn Shells" (*AM*—Aug 25 '27, p323). Practically identical results, a 3¼ in. blank size, will be obtained by either method when applied to the shell.

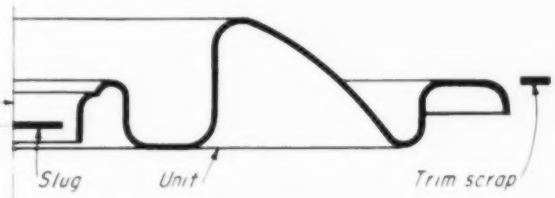


FIG. 1

FIG. 2

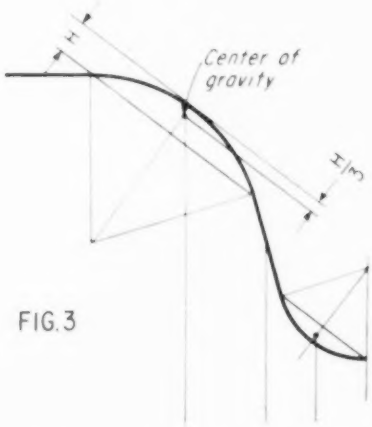


FIG. 3

FIG. 4

In the graphical solution it is not necessary to draw the cross-section of the shell, Fig. 1. It is done so here to show its relationship to Fig. 2, which represents the median line of the material constituting the shell. Fig. 2 is drawn to enlarged scale.

The method of graphical solution is:

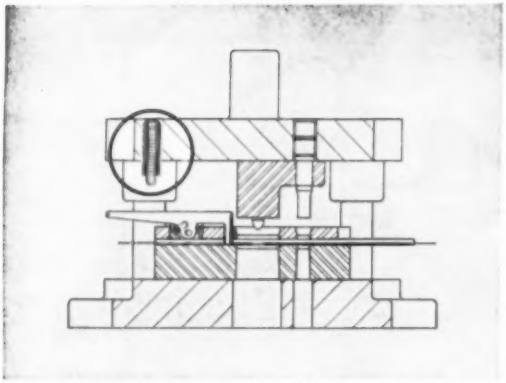
1. Divide the median line into segments. Circular portions are divided into arcs of 90° or less. Irregular curves are likewise divided into arcs of 90° or less and are treated as though having true radii.

2. Determine the center of gravity of each segment. Note construction lines on Fig. 2. Also see Fig. 3. The center of gravity of an arc = $H/3$, as in Fig. 3, where H

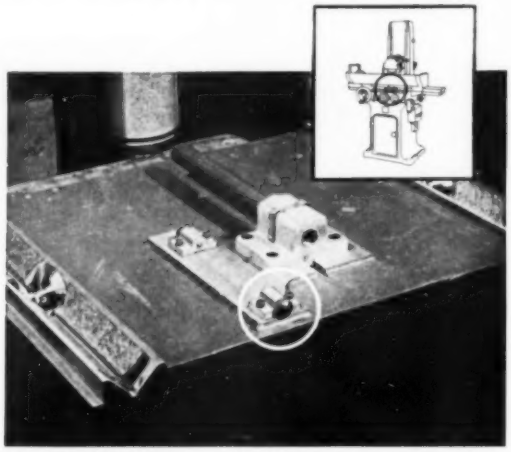
Practical Tooling Tips

Number 2 of a series.

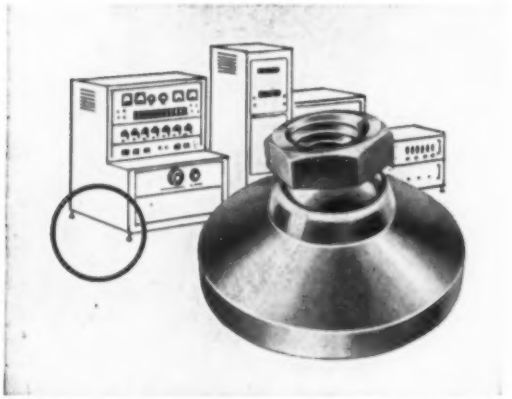
Substituting simple, off-the-shelf Vlier Tooling Accessories for complicated, custom-made devices in both tooling and original equipment applications can result in important savings. Why not put them to work in your plant?



TO STOP SMASHING DIE STOPS, substitute a Vlier Spring Plunger for the usual square-head screw. The plunger actuates the automatic stop perfectly and, unlike the screw, never needs adjusting no matter how many times the die is resharpened. Available in four models: 50 sizes.



TO CUSHION SHOCK as the bed traverses, this surface grinder manufacturer uses two Vlier Spring Stops, reducing wear and tear on the machine. These clever, spring-loaded devices, ordinarily used on fixtures where the absence of side walls prevents the use of spring plungers, are now available in three standard sizes: 3 end pressures. Special sizes made to quantity orders.



TO LEVEL MACHINE TOOLS, electronic racks, benches, etc., use the *standard* Vlier leveling pad. The pad swivels to 7½° each side of the center line; adjusts automatically to uneven surfaces. Unique ball-joint design distributes weight over entire pad surface.

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Blank Diameters of Drawn Shells—II

equals the height of the segment, and $H/3$ is located on the bisector of the segment.

Straight lines have their center of gravity at midpoint.

3. Drop construction lines *a*, *b*, *c* . . . from the centers of gravity of the segments in Fig. 2, namely from segments *A*, *B*, *C* . . .

4. Draw a horizontal line *a'* from any point on the centerline of the shell.

5. At the intersection of lines *a* and *a'*, drop line A_1, equal in length to the length of segment *A*, as stepped off with dividers.

6. From the lower end of A_1, project line *b'* to line *b* dropped from the center of gravity of segments *B*. Now step off segment *B* and draw line B_1.

7. Continue this procedure for all segments and ending with a line drawn from the center of gravity of the trim scrap.

8. With a planimeter, determine the area of Fig. 4.

9. Calculate the blank size from the formula:

$$D = \sqrt{8S}$$

To yield greater accuracy, the shell should normally be drawn several times its true size. My original drawing was three times size. The value of *S* as taken from the drawing was 11.88 sq. in. Then *D* was $9\frac{3}{4}$ in., but true *D* was $9\frac{3}{4} \div 3 = 3\frac{1}{4}$ in.

The diemaker proved out the blank at 3.23 in.

It is convenient to use a planimeter with a modified finder and measuring roller calibrated to a suitable direct-reading scale.

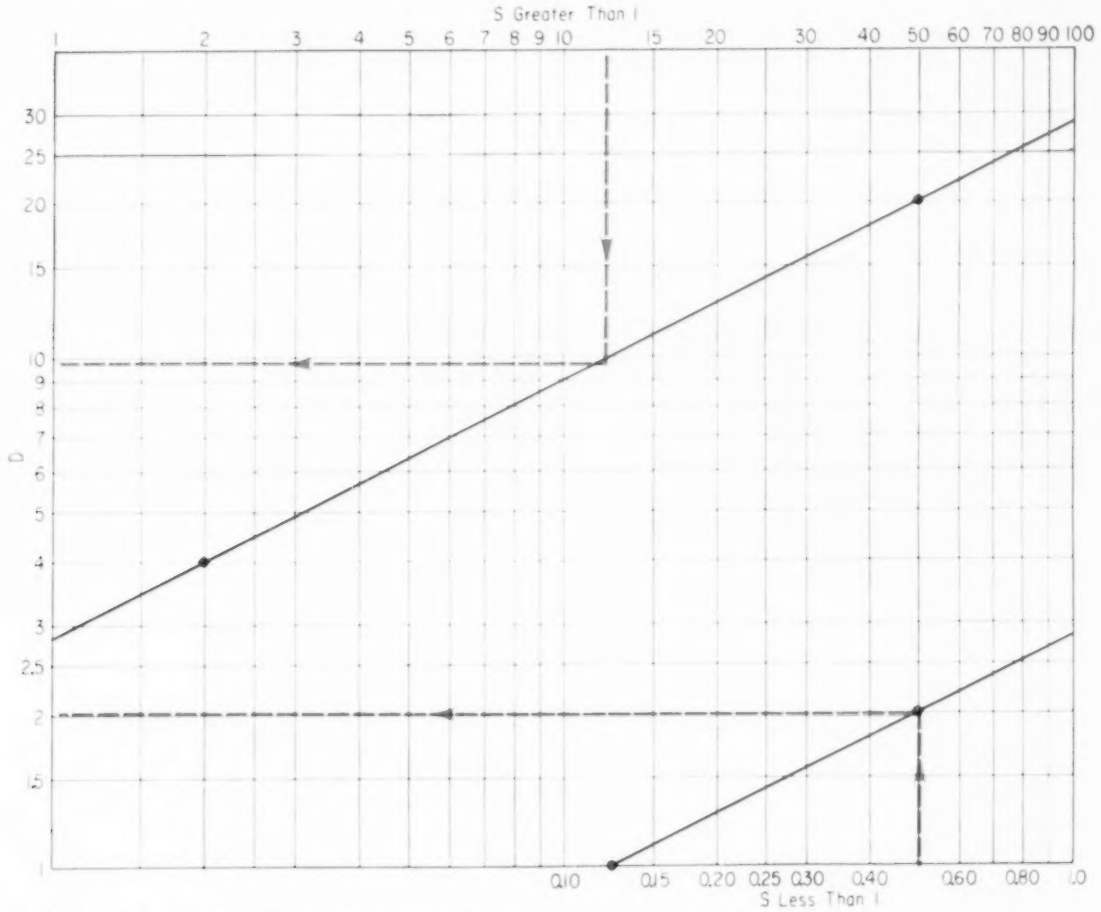
An alternative, or checking, means for finding *S* is the use of the graph on this page. This graph is a logarithmic solution of the above formula. There are two parts to this chart. One part is for solving for blank size when *S* is greater than 1 and the other part for cases where *S* is less than 1. For example:

Upper part of chart—

S = 11.88 approximately. Drop to construction line and move horizontally to the left. The value of $D = 9\frac{3}{4}$ approximately. Since the scale was 3:1, true $D = 9\frac{3}{4} \div 3 = 3\frac{1}{4}$ in.

Lower part of chart—

S = 0.50. Move up to construction line, then horizontally to the *D* scale. Blank diameter is read: *D* = 2.0.



Blank diameter $D = \sqrt{8S}$, where *S* equals the area of the shell, or *D* can be found with this chart

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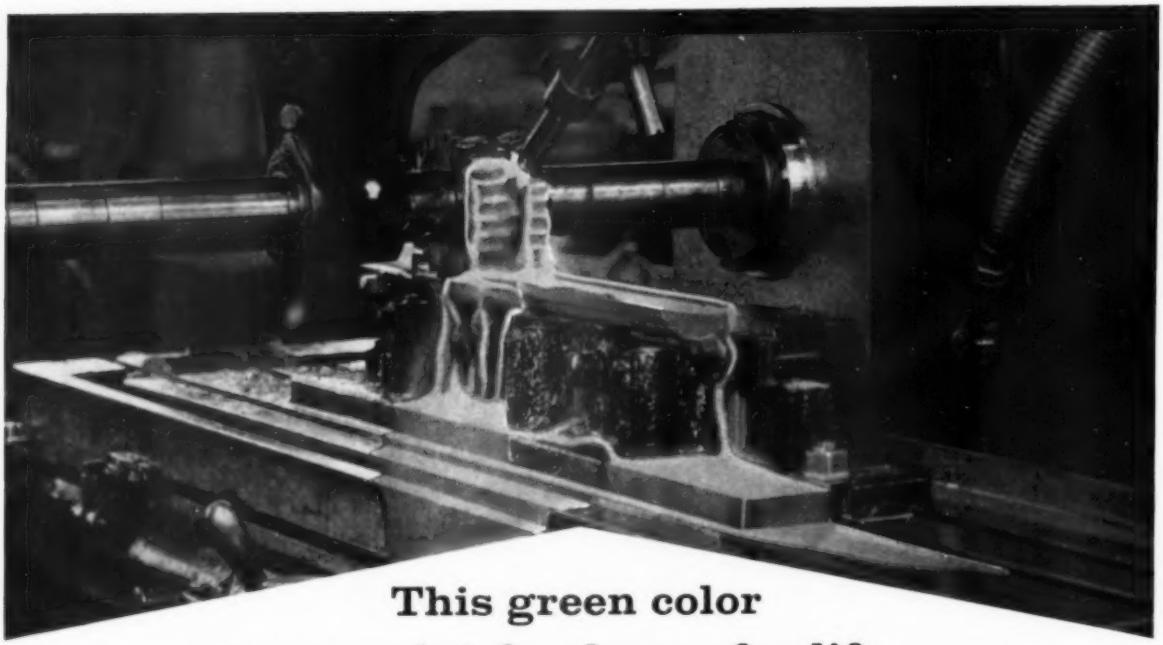

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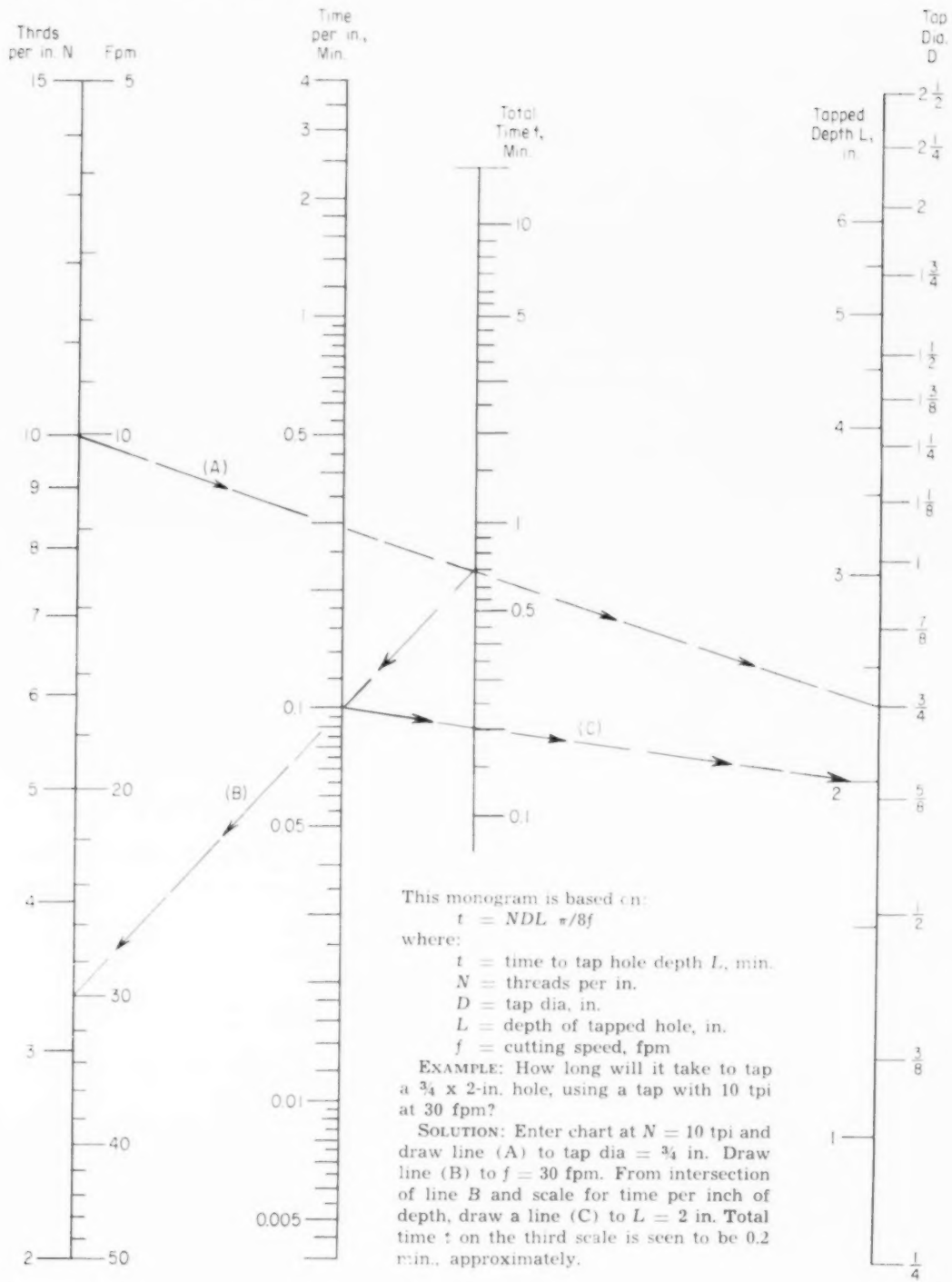
Tapping-Time Chart

By Tyler G Hicks, mechanical engineer



This monogram is based on:

$$t = NDL\ \pi/8f$$

where:

t = time to tap hole depth L, min.
N = threads per in.
D = tap dia, in.
L = depth of tapped hole, in.
f = cutting speed, fpm

EXAMPLE: How long will it take to tap a ¾ x 2-in. hole, using a tap with 10 tpi at 30 fpm?

SOLUTION: Enter chart at $N = 10$ tpi and draw line (A) to tap dia = ¾ in. Draw line (B) to $f = 30$ fpm. From intersection of line B and scale for time per inch of depth, draw a line (C) to $L = 2$ in. Total time t on the third scale is seen to be 0.2 min., approximately.

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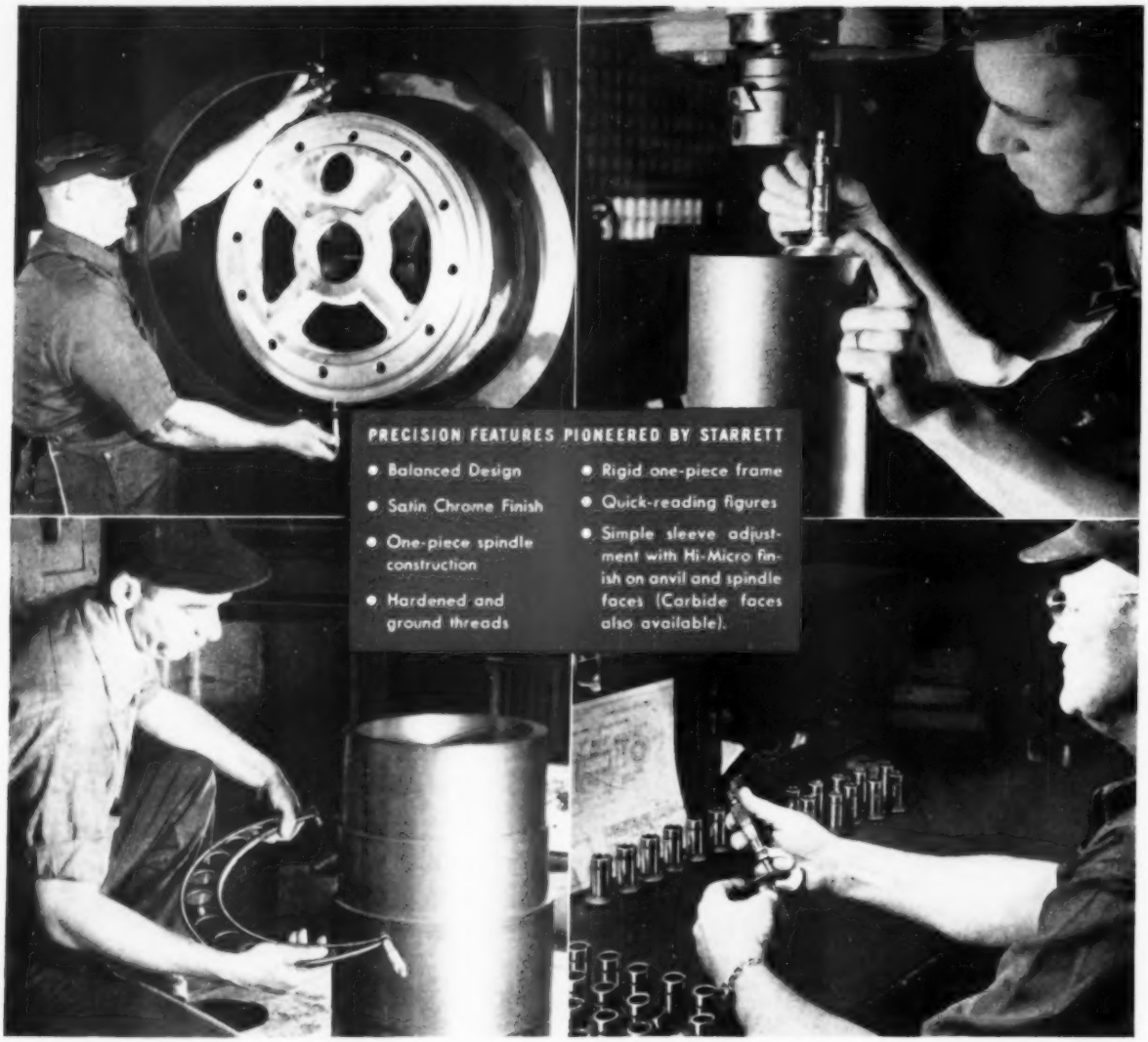
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Talking Shop...

Reeling Detroit

DETROIT AUTOMAKERS, attacked by overseas competitors to the East and small car builders to the West of them, may now turn their eyes to Denver. There Anthony J Moroni announces he will shortly be selling a do-it-yourself kit to convert standard cars to electric drive. A 5-hp motor will drive a 3200-lb car at 45 mph. His aim is a 60-mph speed and a 100-mile range. "We are confident," says Moroni, "that by 1970, fully 50% of the automobiles in urban areas will be electrically propelled." As we reported exclusively in this column some years ago, the Stanley steamer is also trying for a comeback. We leave the two methods, each of which has certain natural advantages, to fight it out. We hope they will not be too discouraged because we just went out and bought a new car (complete with gas engine and fins). We doubt if we'll ever find out what the top speed is, but the range is something over 300 miles between gas stations.

Who did it?

ONE OF OUR CONTRIBUTORS, writing in a slightly sour vein about his suppliers, noted down these questions and answers. They sometimes apply to all kinds of problems:

Q "What, no laboratory?"
A "Too expensive."
Q "What, no hardness tester?"
A "Too expensive."
Q "What, no chemical analysis?"
A "Too expensive."
Q "Who goofed?"
A "Night shift."
Q "How do you inspect your products?"
A "They got to be good."
Q "Is that why they're so cheap?"
A no answer

Inspection by Habit

WHEN YOU HAVE an unsolved problem it is customary to add an inspection at that point to pull out the bad pieces. Then you slowly work out the solution to the problem. Do you then remember to discontinue the added inspection? Or do you, from habit, go on making the additional inspection forever? Calling attention to this, E W Cummings of Saginaw Steering Gear Div, General Motors, reminds us that whether this inspection is charged to direct labor in your department or to overhead somewhere else, it is still a charge against the product.

Fuel Cells

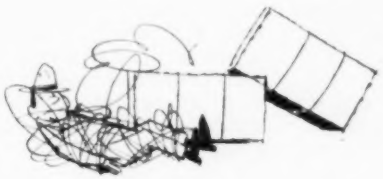
MUCH TALK RECENTLY about atomic batteries that convert nuclear energy directly into electricity. As a practical shop application, however, there may be more future in the hydrocarbon fuel cell with which engineers are experimenting at Esso. The cell might offer efficiency of 80% in converting petroleum gas directly to electricity. If the cell can be made commercially practical, it would have a major impact on industry. At the moment a cell can light a flashlight, but that is a long way from powering a modern machine tool.

Handy Map

TWO COMPANIES have done us a favor recently by publishing on the back of their stationery, clearly but inconspicuously, a street map showing how to find the location of their plants. This is a logical development of a stunt used for years by Watertown Arsenal. Your pass is rubber-stamped with a map of the post on which your route to the shop you are visiting is then marked.

MEMOS

by BESS RITTER



"To go haywire" originally referred to a machine that was designed in the late 1820s for pressing hay into tight bundles and wrapping these compactly with strong wire. Because its operation left much to be desired, the wire not only entangled itself in the working parts of the baler but also succeeded in wrapping itself around the wagon wheels, the horse—and even the operator.

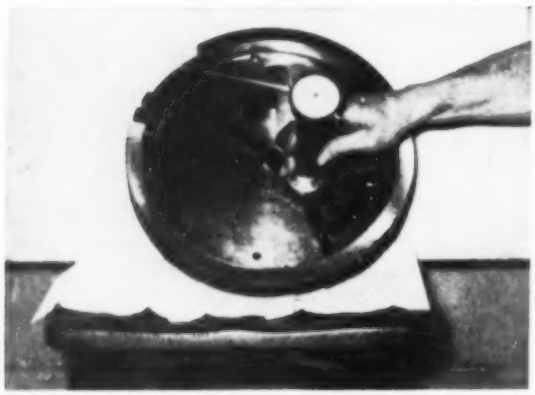
This happened so frequently with the early models that their owners disgustedly described all breakdowns as occasions when the baler inconsiderately "went haywire." Before long the expression also described any planned action of any kind that didn't work out to expectations.

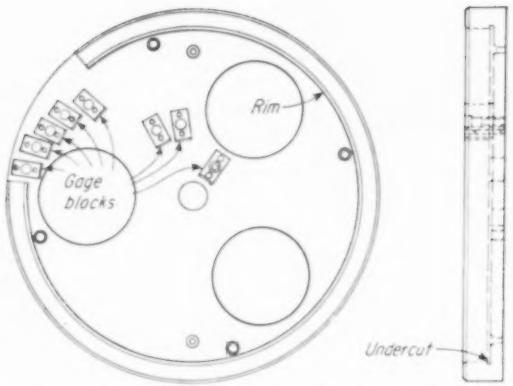
"To blow off steam" originally referred to the early locomotives, which weren't equipped with safety valves. Since the hottest of fires were essential in order to create enough steam to pull the cars, the engineer had to get rid of the excess at reasonable intervals by pulling a hand lever. The immediately following belch of smoke and steam was quite a sight to spectators of the late 1830s, and many who watched compared the spectacle with that of a person who had just lost his temper.

The "chisler" was originally a European native of medieval times who used a tool called the "cold chisel" to achieve dishonest ends. This tool was designed primarly to cut unheated wrought iron, but he used it for clipping the edges of metal coins. Since the metal currency of his time had no modern milled edges, it was easy for him to pass off the remainder of each coin for its full value. Then he melted and remolded his collection of clippings into money.

Practical Ideas...

Compound Master Checks Nine Bore Gages





The prime purpose of this master gage is to check or set standard dial and pin bore gages. It consolidates nine gages of various diameters into one, permitting the operator to accurately set a series of gages, or a single gage, depending on their availability.

Thus, the obvious advantages are savings in manufacturing cost, storage space, and weight. The area of working space on the inspector's plate is increased to allow more parts to be accommodated at each setup.

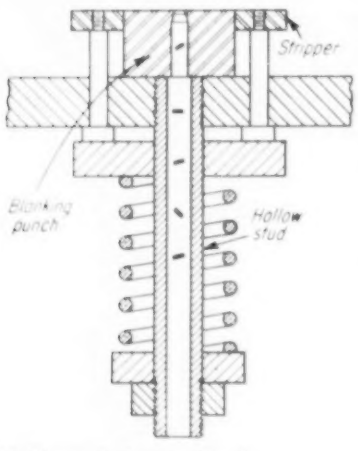
This particular gage incorporates all bore diameters for one specific part. While eliminating the possibility of misplacing any of a set of gages, it also provides better tool control in that only one gage bears the parts-code number instead of several.

The base with its rim is machined from one solid piece with some material left on the ID of the rim for final grinding. Three large holes are bored through the base to reduce weight, and the four tapped holes near the rim are for mounting the base on the grinder. The two countersunk holes are used to fasten the finished gage to a convenient support.

A section of the rim is then milled away and locations for gage blocks laid out. Mounting holes are dirlled and tapped, leaving the dowel holes undersize. These are reamed up after the blocks have been temporarily mounted before hardening the blocks and base.

First, the rim is ground to the largest diameter required. The block furthest from the center hole is then mounted and ground to the next dimension, measurements being taken from the block to the rim. Other blocks are mounted and ground in similar manner until the smallest diameter has been reached.

Michael Burros, inspection supervisor, American Machine & Foundry Corp, Brooklyn, NY



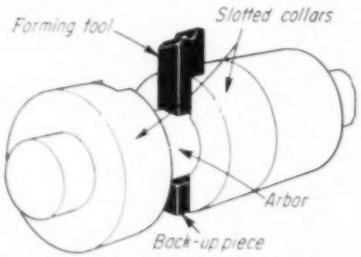
Hollow Stripper Stud Permits Slug Disposal

My job, recently, was to construct a simple die for the production of washer-like parts. Planning on a compound die, the blanking punch would also serve as piercing die. Because of its size, more than one stripper stud would be unnecessary and that's where the rub came in; the piercing hole would be directly above the stripper stud.

An easy solution was found by using a stud large enough so a hole could be drilled through its center for the slugs to pass. See sectional sketch. Aside from the larger diameter of the stud, the rest of the assembly was conventional.

Installation of this type of die in a press means that the stripper arrangement will have to protrude through the bolster plate. In many cases, and this is one, an auxiliary plate with a smaller hole is necessary to better support the die.

Federico Strasser, tooling engineer, Santiago, Chile



Arbor Collar Carries Toolbit

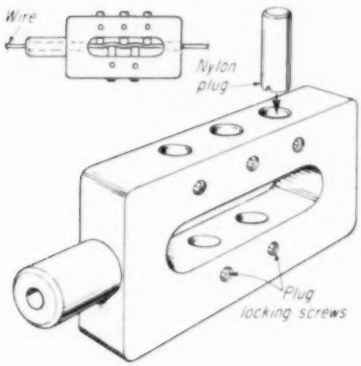
Collars, like the one shown in the sketch, can be made to hold special forming tools in unusual milling operations. They save time and cost of ordering form-milling cutters and are superior to the conventional fly cutters because they hold a tool more rigidly.

A pair of collars are slotted as shown to accept $\frac{3}{8}$-in. square toolbits which we grind to the required

cutting-edge contour. The slots are full width, or 0.375 in., but the combined depth of the slots in the two collars is 0.370 in. to insure gripping power.

With the aid of spacers the tool collars are located where desired on the horizontal arbor. More spacers are added to fill the arbor after which the clamping nut is mounted. If a tool bit is used singularly, a short piece of toolbit is inserted in the opposite side to equalize clamping force. The clamping nut is then tightened and the outboard end of the arbor is supported with the overarm.

Jack Menkes, Brooklyn, NY



Lathe Fixture Straightens Wire

We sometimes have to straighten short lengths of spring wire of various diameters and material. It has been the custom in the past to pull the wire through a bent piece of tubing (goose neck) rotated in the lathe. However, since this was more or less a makeshift rig, difficulties would crop up because of the different wire characteristics. Some method of adjusting offsets was therefore needed.

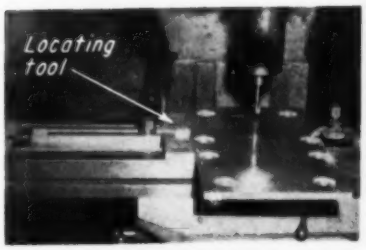
The sketch illustrates a wire straightener we now use and which we find can handle any wire. It employs fiber or nylon plugs that can be adjusted to the offset required.

The tool is made from a piece of flat barstock ½ x 1½ x 4 in. One end is turned down to a ½-in. shank so it may be gripped in a standard ½-in.collet. A ½ in. wide by 2-in. long slot is then milled through the center of the block as shown.

Five ¼-in. holes are drilled and reamed into the slot; three from one edge, and two from the opposite. Into these holes smaller holes are drilled and tapped to receive 10-32 headless setscrews. A small flat on each plug provides landings for the setscrews, and V grooves on the ends of the plugs hold the wire. A ⅛-in. hole through the shank and outer end of the frame completes the tool.

To use it, the plugs are set approximately as shown and the wire is inserted. With the tool shank held in the spindle collet, the wire is gripped with a pair of pliers and pulled through while the spindle rotates at a low rpm.

K Haller, Millington, NJ



Locating Tool for Miller

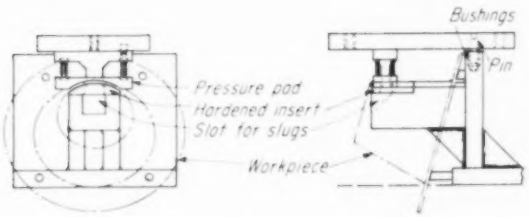
This tool provides a locating barrier for work that requires a surface lateral to the mill bed. With it, any square, rectangular, or round work can be reference positioned to speed clamping. In repeat operations, of work to be machined at other than 90° angles, the tool may be rotated horizontally on the machine table. This method eliminates individual setups for each part piece.

Cut to the shape of a T from ½-in. steel plate surface ground on both sides, the cross bar is 2½-in. wide and 12-in. long. The body is also 2½ x 12 in. with a ½-in. wide clamping slot through its center at right angle to the cross bar.

In line with, and at either end of this slot, on both sides of the body, are locating blocks fastened with hollow-head capscrews. These blocks are made to slip fit into the slots of the machine table and are removed when off-90° angles must be set.

George Robitschek & Jack Johansen, RCA experimental shop, Los Angeles, Calif

Difficult Holes Punched With Aid of Press Fixture



A large number of spinnings required holes and slots punched through their wall thickness. Because of the depth of the parts, and location of the holes, the job obviously called for special treatment.

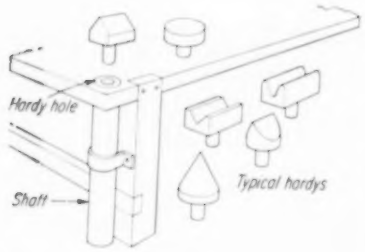
Shown in the sketch are the punch and weldment die holder we made up to handle the situation. The die holder is bolted directly to the press bed of a 32-ton press, bolster plate removed. This allows us to make use of the hole in the bed which is necessary to clear the rim of the workpiece.

The die weldment is constructed of heavy enough material to withstand the punch force without any appreciable give. Alignment is further assured by a pair of heavy guide pins pressed into the punch plate, and guide bushings in the die frame. The die proper is an insert shaped to the inside contours of the workpiece and secured to the horizontal arm. Four pins extend from the frame and base for proper location of the work.

The punch holder is bolted directly to the ram without the use of the customary shank. Combination pressure pad and stripper is attached to the punch, making this an independent unit easily exchanged with another of different size or shape.

Gene A Norman, tool engineer, Breuer Mfg Co, Chicago, Ill

Practical Ideas...



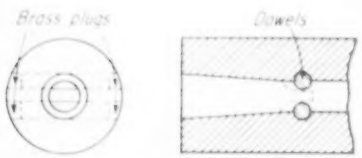
Bench Hardy Hole Aids Fabricators

Jobbing shops are many times asked to fill the strangest requests. Such jobs usually call for fabrications of some kind or another. It is then that a man's ingenuity and available equipment must be employed to full capacity. Often, parts have to be hand worked, but some shops are not geared to do this work other than some bending and hammering in a vise.

The above sketch shows how we have made hand forming more convenient with a hardy hole fitted to the bench, flush with the top, and strapped to the bench leg. The hole is drilled into the end of a piece of shafting long enough to reach from the floor to the top of the bench. If the floor is of concrete, it would be even better to make the shaft longer and anchor the bottom end in the floor.

Pictured also in the sketch are a few suggested hardys and forming tools, some of which we use daily. These are made up as needed. After a shank has been turned to suit the hardy hole, the cones, V's, or whatever shape is required, are machined. The tool is then heat treated for lasting usefulness.

Charles H Wiley, Penacook, NH.



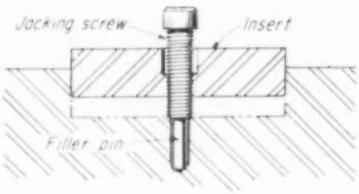
Dowels Form Tang Slot

The problem of tapered-shank tools rotating in the tailstock has been solved by some tool manufacturers with a tang slot through the quill. While this feature is desirable, it may not be practicable to make a new quill just to duplicate the idea.

A satisfactory substitute can instead be made by inserting two dowel pins to partially occupy the bore. When properly located, they form a slot for the tang, allowing it to protrude past the pins so that the feed screw can eject the tool. In some instances it may be necessary to turn down the screw a short distance so it can pass between the pins to eject tools without a tang.

After the holes for the dowels have been drilled and reamed—and this may call for plugging the bore—the dowels are driven in and the holes sealed with brass plugs. These plugs are left a little long and are, after insertion, cut off and filed smooth with OD of the quill.

R C Conklin, Kingston, NY



Tapped Clearance Holes Aid Insert Removal

Many die-produced parts are similar to the extent that they are made by the same tooling, but vary in some degree with the addition or removal of details. Such alterations are generally achieved with inserts which must be installed or removed according to needs. These changeovers should be planned so they can be made without dismantling the die.

The above illustration describes a simple, yet effective, aid by which this can be accomplished. By tapping the clearance holes for the hold-down screws in the inserts, a screw to fit this thread can be used to jack it out of place.

In the illustrated example, the hold-down screw is a ¼-in. cap-screw, and the jack screw a 5/16-in. screw with a thread long enough to lift the insert clear out of the recess. A 5/16-in. clearance hole could be tapped to ⅜-in.; a ⅜-in. hole to 7/16 in. and so on. Should it be expected that the thread in the die may be damaged because of excessive pressure, a short piece of round stock can be dropped into the hole to take the brunt of the jacking screw.

R K Dulek, Racine, Wis

Fred P Faltersack
Santa Clara, Calif

$25 In addition to regular payment for his idea:

CARBON DRILL CUTS TUNGSTEN

in the Jan 12, 1959 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

PAYMENT—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

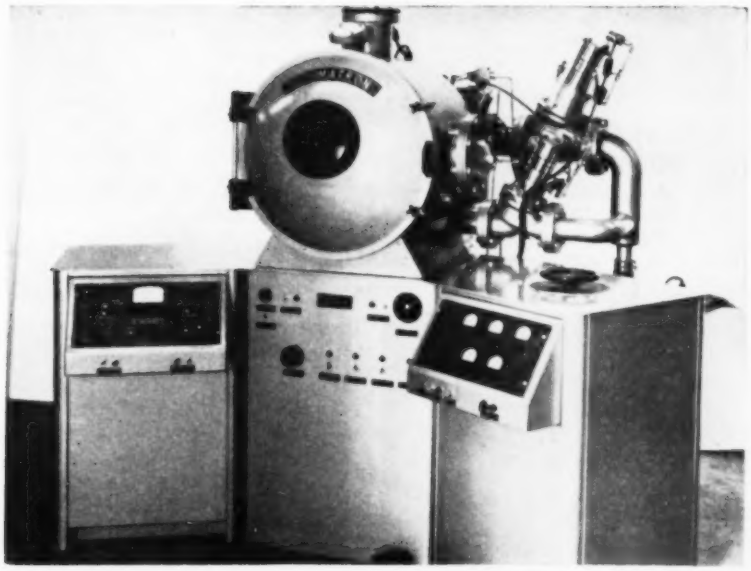
JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N.Y.

New Shop Equipment
Materials and Parts



Production Electron-Beam Machine Offered For Welding Reactive Metals, Superalloys

One of the first electron-beam machines to be put on the market for production welding of high temperature reactive metals and super alloys is this Model B-1520 Beamatron made by the High Vacuum Equipment Corp of Hingham, Mass.

As described previously (*AM*—Feb 23 '59, p95), the electron-beam welding process produces heat by bombarding the work with a stream of electrons traveling at extreme velocities through a very high vacuum.

The Beamatron's power supply is rated at 15,000 volts at 200 milliamps —3000 watts. It can weld tubing or parts up to 3⅛-in. dia in lengths up to 10 ft. A turntable can be installed for spot welding small parts.

The vacuum chamber containing the electron gun and collet for rotating the work is mounted on top of a console-type cabinet which contains all controls, instruments, and power supply. To the rear of the console cabinet is the vacuum pumping system.

Controls are simple and grouped within easy reach and direct sight of the operator. A system of overload relays, interlocks, and vacuum safety switches protects the operator from high voltage. The vacuum pumping system is operated through a rotary sequence switch which makes it impossible to open the vacuum valves in the wrong order.

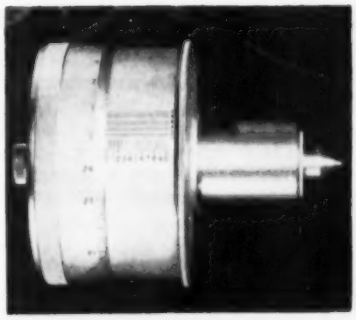
Precise positioning of the electron gun is accomplished by use of standard vacuum system remote controls. Control circuits are adjusted through variable transformers.

Electron-beam welding is a fail-safe operation and cannot oxidize or contaminate the work. Because a high vacuum is necessary to support an effective electron beam, the beam will be broken if the pressure rises above a critical level.

According to the manufacturer, production personnel can be easily trained to operate the equipment, even though they have had no previous experience in performing conventional welding operations.

High Vacuum Equipment Corp, 2 Churchill Rd, Hingham, Mass

MORE DATA? Circle 51, inside back cover



Ultra-precise Micrometer Is Accurate to Ten Millionths

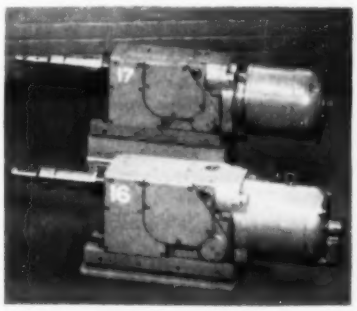
This ultra-precise micrometer, developed for use in manufacturing gages, instruments, machine tools, and precision parts, is accurate to ± 0.000010 in.

The lead screw, nut, and barrel of each micrometer are calibrated as an integral unit and the serial number is registered. The micrometer has a 4-in. dia barrel for easy reading and comes in standard size ranges of 0-1 in. and 0-2 in. They can be ordered with graduations arranged for reading right or left, normal or reverse, as preferred.

Other micrometers of this style include one with an accuracy to ±0.000015 and the other to ±0.000020.

Sheffield Corp, Dayton 1, Ohio

MORE DATA? Circle 52, inside back cover



Automatic Drillers and Tappers Feature Long Stroke, Cam Feeds

These automatic units—two drillers and two tappers—have long strokes and a cam feed for accurate repeti-

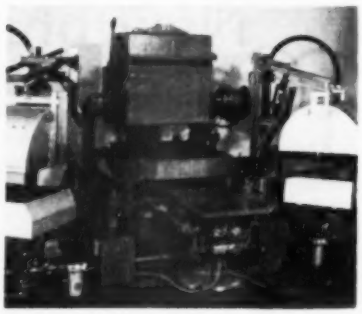
tion of the work cycle. There is a 4-in. stroke on the smaller units and a 5-in. stroke on the larger ones.

Models 4 and 16 are drilling units, and 5 and 17 the companion tapping units. Each drilling unit may be converted to its companion tapping unit by using a different feed cam, a reversing motor and controls to reverse them. The tapping units can have time cycles as short as 3 sec.

The capacity of Model 16, the larger driller, is ¾ in. in cast iron and ½ in. in forged steel. Model 17, the comparable tapper, has a capacity of ⅝—11 in cast iron and ½—20 in forged steel.

Kingsbury Machine Tool Corp, Kenne, NH

MORE DATA? Circle 53, inside back cover



Twin Shell Molder Provides High Production at Low Cost

Twin shell molding machine produces finished shell molds alternately on two stations. Manufacturer claims that it will produce more finished molds per operator than any other machine, yet costs no more than most single station machines.

Other features include ovens with direct heat below the pattern and indirect heat above the pattern, vertical drop of sand-resin mix for denser shells, self-alignment at investment and ejection station, and adjustable speed hydraulic cylinder.

Specifications: weight, 10,500 lbs; maximum pattern height, cope 8 in., drag 8 in.; 80 lbs minimum operating air pressure; 10 cu ft of free air per cycle; electrical rating, 110v, 60 c ac; burner capacity, 800,000 btu's per hour per oven.

Shell Process, Inc, 366 Bliss St, West Springfield, Mass

MORE DATA? Circle 54, inside back cover

Tracer Control Attachment Converts Vertical Turret Lathes for Precise Contour Turning

Vertical turret lathes can be converted for contour turning within extremely close tolerances with the electronic-hydraulic Duplimatic tracer control attachment.

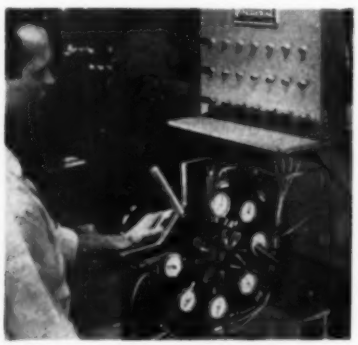
Hemispherical or irregularly shaped surfaces can be contoured automatically inside and out. High response Pegasus servo valves are mounted directly to Vickers piston motors. This tight position loop, complemented with tachometer feedback directly from the hydraulic motor shaft, permits tolerances of ±0.005 in. at 25 ipm and ±0.0005 in. at 5 ipm. Of course, the vertical lathe to which the tracer control is attached must be capable of maintaining these tolerances.

The tracer unit does not interfere with conventional operation of the machine tool. The hydraulic motor drive units disengage by means of magnetic clutches with the start and stop button. Each of the electronic components is of modular construction and can easily be removed for servicing.

All mounting brackets and field supervision of installation are included with the attachment.

Tracer Control Co, 595 E Ten Mile Rd, Hazel Park, Mich

MORE DATA? Circle 55, inside back cover



Electric Gage Inspects Stack Of Seven Cams Simultaneously

Groups of seven different cams, arranged in stacks, are checked for contour, proper stacking, and broken or chipped edges on this semi-automatic electric gage.

The stack to be checked is positioned on a shaft on which a master cam stack is permanently fixed. Reference contacts ride the contours of each of the seven cams in the master stack. The sensitive gaging contacts which check the workpieces are coupled to the reference contacts by means of pantographs and follow them exactly as the shaft is rotated.

Any difference between a reference contact and its counterpart moves the spindle of electrified dial indicator gaging units. The movement of the spindles activates signal lights which flash amber if the cam is under, green if it's OK and red if it's over. A set of three signal lights is connected for each cam in the gage.

Federal Products Corp, Providence, RI

MORE DATA? Circle 56, inside back cover

Automatic Double Carriage Lathe Has 60° Controlled Front Tool Slide

Model 20-H Mona-Matic with air-gage tracer controlled front tool slide has hydraulically powered front carriage and rear slide. Machine is available in 18, 30, and 42-in. center distance.

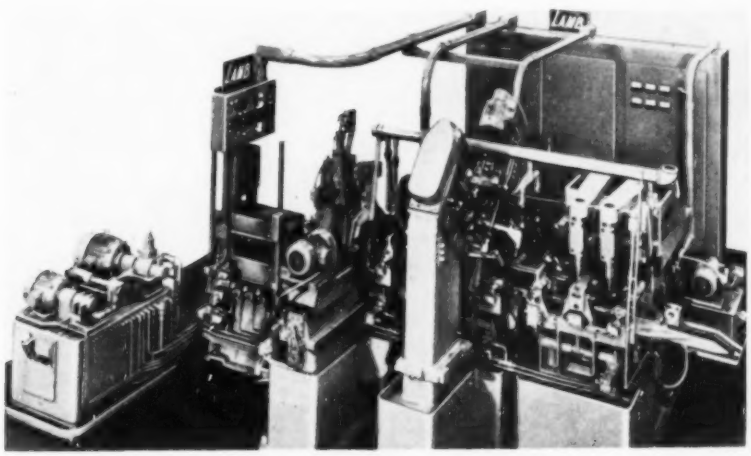
Swing over bed is 15 in.; over front slide and rear slide ways, 8 in. Two-speed main drive motor may be applied to the helical geared headstock equipped with power clutch and brake. Eight spindle speeds are available by pickoff gears in each of three standard ranges. Tailstock has an air-actuated spindle and built-in, heavy-duty, anti-friction center.

Front carriage feed and traverse are accomplished by a cylinder mounted in the apron. Feed rates are infinitely variable from 1 to 40 ipm. Carriage traverse is 200 ipm. Rear slide feed rate is ½ to 40 ipm, traverse is at 90 ipm. Rear slide has an adjustable positive stop to control max slide travel.

Either a one or a two-cut cycle can be furnished. Four different feeds are available to the carriage for use with a single cycle. On two-cut cycle models one feed only may be employed during the rough cut, the remaining three during the finish cut.

Monarch Machine Tool Co, Sidney, Ohio

MORE DATA? Circle 57, inside back cover



AUTOMOTIVE PISTONS of three different sizes are handled by this 10-station machine which machines 400 parts per hour. Processing sequence is load, orient, rough bore wrist pin bores, drill angular holes in wrist pin bores, probe drilled holes, saw smoke slots. Additional functions can be added between the main stations of the machine—*F Jos Lamb Co, 5663 E Nine Mile Rd, Detroit 34, Mich*

MORE DATA? Circle 58, inside back cover

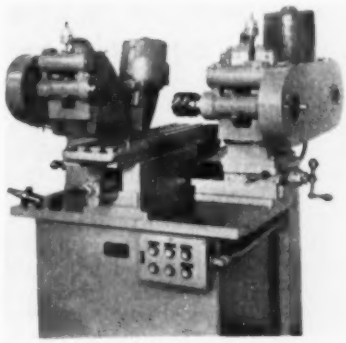
Pneumatic Planishing Machine Removes Sheet Metal Wrinkles

Model 200-RHP-180 is a floor mounted repeating hammer developed to smooth out wrinkles in sheet metal left by presses and drop hammers. It may also be used to increase or decrease curvature or for forming, preening, crimping, flanging, and riveting.

A foot pedal is used to bring the tool in contact with the work. Valving is internal and is actuated by the pressure of the tool against the work. As long as contact pressure is maintained the hammer will repeat at from 1000 to 3000 times per minute, depending upon the air pressure used.

Heidrich-Nourse Co., 631 E Third St, Los Angeles 13, Calif

MORE DATA? Circle 59, inside back cover



Duplex Half-Mill Simplifies Gang Milling of Flats on Shafts

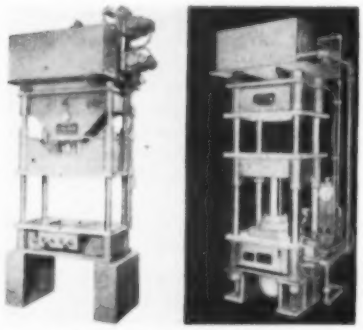
Machine designed for gang milling of flats on the opposite ends of short steel shafts can mill 10 to 12 shafts simultaneously. Although the cut is light, large cutters are used, necessitating slow spindle speeds. A flange-mounted 1800-rpm motor attached to a worm and wormwheel (10:0 reduction) speed reducer is used in place of a conventional gear motor. Spindle speeds provided are 86, 112, 143, 218, 278, and 360 rpm. Half-Mills are mounted with one leading the other by 1 in. in order to keep the opposed milling cutters from machining the same shaft at the same time.

Model pictured, built for a large electrical manufacturer, has an 8 x 32-in. table, hardened and ground table ways, and JIC wiring and controls. Table feed cycle is rapid approach, controlled cutting speed and distance, and automatic rapid return. Machine is also available with 6 x

23, 10 x 36, 10 x 42, 10 x 48, and 10 x 54 tables, as well as 12, 18, 24, and 30-in. air-hydraulic or 18 and 30-in. full hydraulic longitudinal table feed.

US Burke Machine Tool Division, Brotherton Rd & Pennsylvaina RR, Cincinnati 27, Ohio

MORE DATA? Circle 60, inside back cover



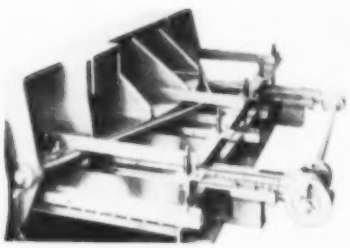
Four-Column Hydraulic Press Line Expanded to 25-1000 Ton Range

Line of four-column single-action hydraulic presses has been modernized and expanded to 48 models, ranging from 25 to 1000 tons. Illustrated are the 20-ton down-acting press (left) and the 80-ton up-acting press.

Presses can be fed from the front, back, or side and are available in either up-acting or down-acting models. They can be outfitted with manual lever or electric push button controls for single or continuous cycling. Die cushions, steam or electrically heated platens, and other accessories are available.

KR Wilson, Inc, Arcade, NY

MORE DATA? Circle 61, inside back cover



Shear Uses Roller Magnets To Eliminate Sheet Sag

A series of roller magnets supports sheets up to 14 gauge to provide greater accuracy in shearing. Without the sheet support, there is a 4-in. sag on 16-gauge sheet between the cutting edge and back gauge when extended 24 in.

Illustration shows a sheet of 16-gauge mild steel being held in a straight plane with its leading edge in contact with the back gauge angle. The channels which hold the magnetic rollers can be lifted easily and can be locked above the back gauge when support of a sheet is not required.

Wysong and Miles Co, Greensboro, NC

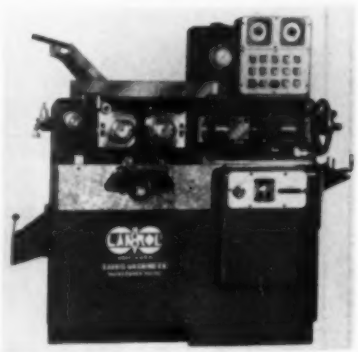
MORE DATA? Circle 62, inside back cover

Coolant Cleaning Equipment Operates by Jet Action

The Impinjo filter uses a new cleaning principle. Contaminated liquids are impinged by jet action of the liquid upon a movable, disposable filter medium which is automatically fed through the filter. Both ferrous and non-ferrous solids are removed. In some models, a magnetic separator is installed as an integral part of the unit to remove heavy concentrations of ferrous solids. Impingement action further filters the coolant or cutting oil being cleaned and returns it to the machinery for re-use free of any harmful abrasive solids.

Inflico Inc, Tucson, Ariz

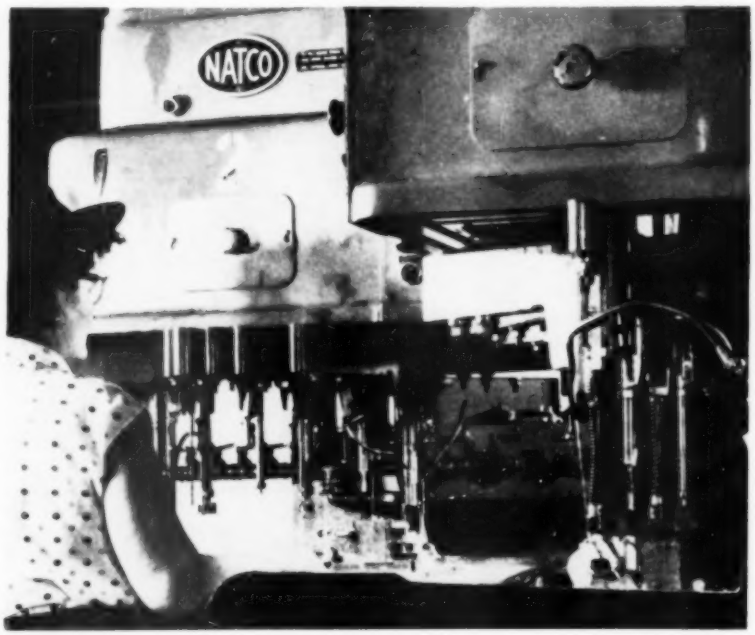
MORE DATA? Circle 63, inside back cover



Thread Rolling Machine Handles 13½-in.-long Double End Studs

Lanhyrol model has been developed to handle double end studs up to 13½ in. in length. Through extended spindles, the machine will produce sizes ⅜ to 9/16 in. at rates of 102 per minute, and ⅝ in. at 80.

Two methods of rolling are available. First and fastest is by segmental or cam periphery dies with mechanical indexing for parts up to and including ⅝-in. dia on either single or double end work and for ¾-in. dia, single end only. In this range, combinations of coarse and



CARBURETOR COVERS AND FUEL BOWLS are machined on these two multi-spindle Natcos for Zenith Carburetor. Formerly, machining the two parts required a total of seven operators using fourteen drill press spindles. Now the same machining is run by one operator at an estimated cost savings of 81% on the cover and 70% on the fuel bowl—*National Automatic Tool Co, Inc, Richmond, Ind*

MORE DATA? Circle 64, inside back cover

fine pitches, left and right hand, large and small diameters or identical threads may be rolled. Second method available is used for work larger than ¾ in. in dia on one end only. Plain cylindrical infeed dies are used with an automatic infeed cycle, and electro-pneumatic indexing is substituted for mechanical.

Changeover from one diameter to another requires only interchanging the thread rolling dies, magazine chute rails, and work-carrying rings in the indexing cage.

Landis Machine Co, Church & 5th Sts, Waynesboro, Penna

MORE DATA? Circle 65, inside back cover

Portable Pressure Lubricator Speeds Drilling and Tapping

Squirt, specially designed for one-touch cutting tool lubrication, has a heavy cast iron base and handle. Precision oil pump controls amount and pressure of oil flow. Flexible metal hose is positioned to deliver oil right at the cutting edge of tools.

Unit can shoot oil directly to the edges of drills and taps in lathe work, and right to the dies in pipe threading jobs.

C-B Tool Co, Wabank Rd, Lancaster, Penna

MORE DATA? Circle 66, inside back cover

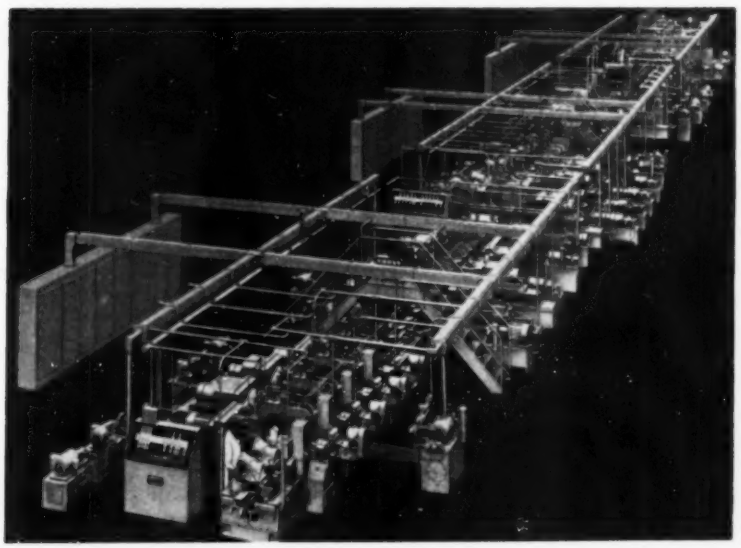
Miniature Reamers Can Be Sized To Millionths Within 15 Minutes

Solid carbide miniature reamers can be sized with accuracy to millionths in less than 15 minutes. They are designed to solve design problems presented by drilling and sizing holes 1/16 in. or less.

The reamers are said to have greater rigidity, longer cutting life, and less breakage. Sizes are 1/16 and 1/32 in.

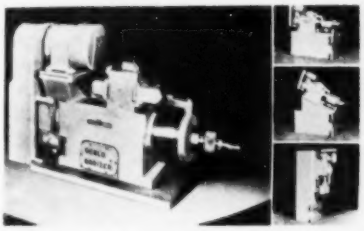
Microtron, Inc, 6 Manhasset Ave, Port Washington, NY

MORE DATA? Circle 67, inside back cover



FOUR DIFFERENT AUTOMOTIVE TRANSMISSION CASES are produced on two Cross transfer machines which have innovations such as tool protectors—(AM—Mar 19, '59, p147), static controls, electro-mechanical sensing devices, and transfer and fixture improvements for aluminum parts. The shorter of the two lines is illustrated above—Cross Co, PO Box 3835, Detroit 5, Mich

MORE DATA? Circle 69, inside back cover



Borizer Unit Rotates and Feeds Single or Multiple Tools

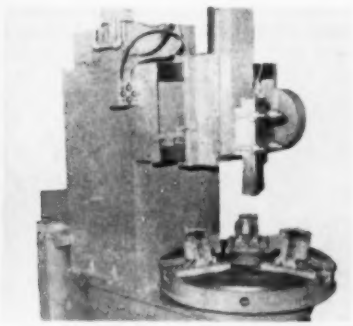
Self-contained Red Head unit called a Borizer generates its own hydraulic power and is used singly or in groups for drilling, reaming, counterboring, chamfering, plunge facing, and similar operations. Using supported guide bushings it can also do precision boring with either a single or multiple tool quill. Designed to provide economical multiple tooling in automated or special setups in a wide variety of applications, it is said to be particularly adaptable to performing several single or multiple-spindle operations in sequence by mounting several units, horizontally, vertically, or at any other angle, either on a single base or along an automated line.

Additional features: compact size permits close mounting; electrical controls may be separate or integrated with master controls of an automated line; where central hydraulics are available, units may be obtained without integral hydraulic pumps.

Borizer is available in four sizes with strokes of 8, 10, 12, or 15 in. and with thrust for multiple operations ranging from 9800 to 18,900 lbs.

Heald Machine Co, 7 New Bond St, Worcester 6, Mass

MORE DATA? Circle 68, inside back cover



Automatic Vertical Boring Mill Operates at 75-400 rpm Speeds

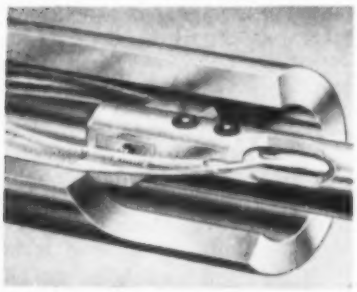
This automatic high speed vertical boring mill is powered with a 25-hp motor with six independent speeds

operating from 75-400 rpm. The machine, which has a 42-in. dia table with 24 in. under the fixed cross rail, will finish contouring the ID of couplings ranging from 3-in. bores to 15-in. dia.

The tools automatically cut to the correct depth, feed horizontally to the correct diameter, reverse travel horizontally and return to the upper end of the stroke within 17 seconds. Length of the vertical tool cut is approximately 7 in.

Young Machine Tool Div, Young Testing Machine Co, Church Rd, Bridgeport, Penna

MORE DATA? Circle 70, inside back cover



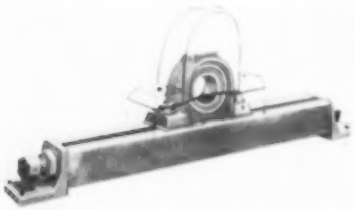
Boring Bars with Coolant Veins Available in All Standard Sizes

Boring bars with coolant veins are now available from stock in all standard sizes. Introducing the coolant at the cutting edge reduces chip interference, eliminates intermittent heating and cooling, and eases chip removal.

It is reported that this bar will provide a uniformly smooth finish on all boring jobs, extend tool life, and eliminate improvised coolant systems for special jobs.

Vee Bee Mfg Co, 2632 Park St, Muskegon, Mich

MORE DATA? Circle 71, inside back cover



Take-up Frame Accommodates Any Type of Pillow Block

Take-up frame has one basic size that, according to the manufacturer, accommodates all types of pillow blocks—ball, roller, or babbitted. It is also said to be the only frame available that can be top or side mounted. The flange connection can be swung either way simply by loosening a locknut.

Sizes and travel lengths range from 2 to 36 in. They will accommodate pillow blocks ranging from ½ to 2 7/16 in.

Lovejoy Flexible Coupling Co, 4966 W Lake St, Chicago 44, Ill

MORE DATA? Circle 72, inside back cover

Unit Picks-up, Aligns and Feeds Sheets Into Press Automatically

Using a vacuum mechanism, this automatic press feeder will pick up a sheet or plate from a stack, place it on the driven roll table, align it with the dies, and feed it into the press. Only one operator is needed for the entire job.

The machine will handle sheets or plates from 3½ to 8 ft wide, 7½ to 12 ft long, and weighing up to 600 lbs. Cycle time is one minute. Operation can be either continuous at fixed cycle, or intermittent. Equipment requires 10½ by 28 ft of floor space and 10 ft of head room.

Herr Equipment Corp, 1201 Vine St, Warren, Ohio

MORE DATA? Circle 73, inside back cover

COLLET WITH REPLACEABLE JAWS is said to reduce collet costs up to 80%. Unit fits all lathes using standard 5C collets. Jaws finished in steel, aluminum, or other material for special work holding—*Crest Precision, El Monte, Calif*

MORE DATA? Circle 74, inside back cover

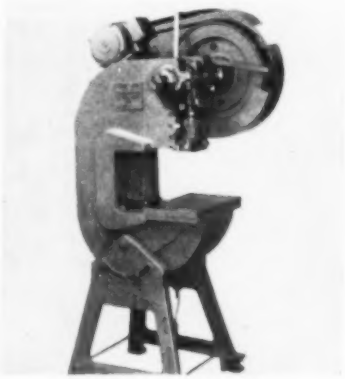
Welding Unit Can Be Used For Plasma Jet Process

The SR-1000-A1 delivers 1000 amps dc at 40 v on 100% duty cycle. Single current range adjusts output from minimum of 200 amps to maximum of 1600. It has a completely sealed semi-metallic rectifier and requires less than 9 sq ft of floor space.

According to the manufacturer, this model has proved to be an exceptionally satisfactory power source for the plasma jet process, heavy submerged arc welding, Arcair gouging, and some electric furnace applications.

Miller Electric Mfg Co, Inc, Appleton, Wis

MORE DATA? Circle 75, inside back cover



Press-Rite 15-ton OBI Press Available in Deep Throat Model

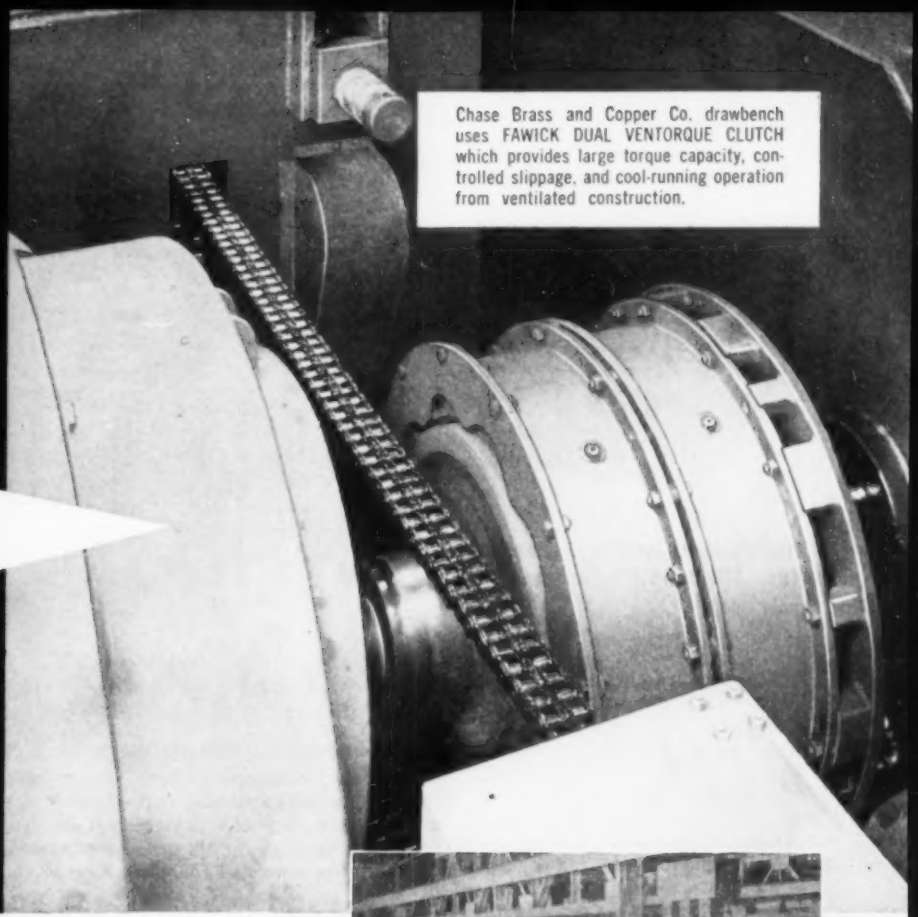
Frame of this new unit is a rugged steel weldment with heavy reinforcement at the points of strain.

The 12-in. throat depth makes it possible to do many trimming, drawing, forming, blanking, and punching operations on metals and plastics that would otherwise have to go on a larger press.

Sales Service Mfg Co, 2565 University Ave, St Paul, Minn

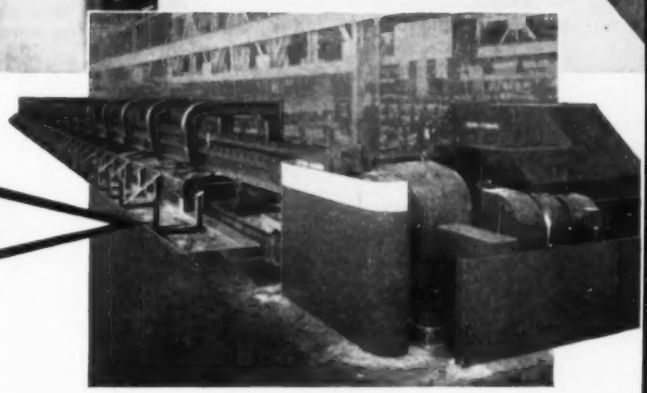
MORE DATA? Circle 76, inside back cover

Fawick Clutches here...



Chase Brass and Copper Co. drawbench uses FAWICK DUAL VENTORQUE CLUTCH which provides large torque capacity, controlled slippage, and cool-running operation from ventilated construction.

provide smooth acceleration, full power HERE!



Record size of this Chase drawbench, which draws up to 6-inch tube to 210 feet, demands extra-smooth operation. FAWICK VENTORQUE CLUTCH assures shock-free starts and steady acceleration of bench carriage to prevent tube binding or irregularities.

The drawing of smooth-surfaced, accurate dimension tubing requires controlled acceleration at the start of the draw and steady, full-power pull through the drawing cycle.

This is accomplished on the world's largest drawbench at the Euclid plant of Chase Brass and Copper Company, by smooth transmission of power from a 500 h.p. motor and speed reducer to the bench mechanism through a FAWICK 20VC600 Dual Ventorque Clutch. This bench, built by Aetna Standard Manufacturing Company draws continuous tubing to 210 feet long in sizes ranging to 6 inches in diameter.

The draw starts with simultaneous engagement of the clutch and hooking of the draw carriage to the driving chains. Gradual acceleration is accomplished through controlled slippage of the clutch while bringing the carriage to full drawing speed. This is done with a flow control valve which gradually increases the air pressure in the clutch and results in smooth, yet positive acceleration of the chain and carriage.

This is typical of many installations where the inherent advantages of FAWICK Clutches provide top-performance answers to power-transmission problems.

For full details on FAWICK power-transmission products call or write your nearest FAWICK representative or the Home Office, Cleveland, Ohio.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO
Fawick Canada, Ltd., 60 Front St., West, Toronto, Ont., Canada

FAWICK AIRFLEX

INDUSTRIAL CLUTCHES AND BRAKES

CIRCLE 279 READER SERVICE CARD

Electric Heat Treating Furnaces Have 300-2000 F Temp. Range

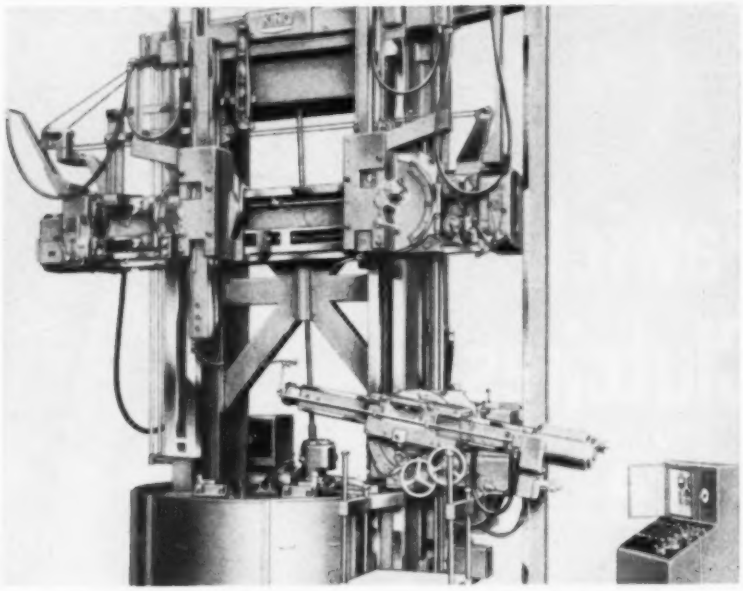
Two electric heat treating furnaces, designed for quantity production use, have a temperature range of 300 to 2000 F. Chamber dimensions are 10 by 7 by 18 in. and 8 by 6 by 14 in.

Furnaces feature multi-slab type of insulation, heavy sheet steel body, cast iron end frames, cast nickel chromium hearth plate and a vertically operated plug-type door.

According to the manufacturer, the elements may be changed in minutes without disassembling the furnace.

Cooley Electric Mfg Corp, 38 S Shelby St, Indianapolis 7, Indiana

MORE DATA? Circle 77, inside back cover



BORING MILL FOR MISSILE PRODUCTION retains standard facilities for general duty machining. Features include: swiveling type side head arranged for tracer controlled turning and grinding operations; 3-position tool holder for side head which can be changed with grinder quills for turning operations; grinding attachment with multi-speed motorized spindle extending through side head—*American Steel Foundries, King Machine Tool Div, Cincinnati 29, Ohio*

MORE DATA? Circle 78, inside back cover

Digital Micrometer Features Automatic Scanning, Printing

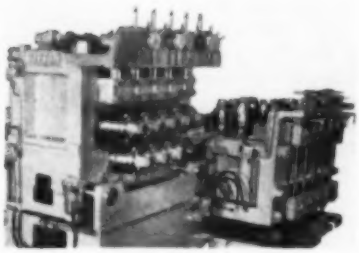
Model 700 digital micrometer automatically scans and prints dimensional data with accuracy to 0.0001-in.

From one to 99 gaging points can be measured in rapid sequence with the identification number and dimension of each part printed automatically on paper tape or stringed cards. Operation can be manual, semi-automatic, or completely synchronized with manufacturing and inspection processes.

Optional output forms include illuminated digital display, input to IBM equipment, and automatic limit detection for alarm or reject. Prices begin at $2400.

Daytronic Corp, 216 S Main St, Dayton 2, Ohio

MORE DATA? Circle 79, inside back cover



TWO-PLANE STRAIGHTENER provides high-speed straightening of steel and nonferrous flats and shapes. Using extremely large roll shafts on close centers, the machine will accurately straighten squares from ¼ to ½ in., hexagons from ¼ to 1¾ in., and flats up to 2½ by ½ in.—*Sutton Engineering Co, First National Bank Bldg, Pittsburgh 22, Penna*

MORE DATA? Circle 80, inside back cover

End Mills Feature Continuous Curve Fluting, Eccentric Radial Relief

These G Type end mills are made with a generated flute shape in a continuous, flowing curved surface from the cutting face of one tooth to the cutting face of the adjacent tooth.

Another feature of the end mills is the eccentric radial relief on the OD, which eliminates the possibility of heel drag.

These features, according to the manufacturer, result in exceptionally sharp cutting edges, elimination of chip traps, better finishes, and longer life per grind.

Four-tooth end mills from ⅛ to

AIRBORNE *TACAN* DEMANDS THAT PARTS LIKE THIS FIT PERFECTLY, EVERY TIME

. . . and here's how ITT's Standards Lab makes sure they do

This heater and cathode contact ring assembly is used with a lighthouse-type electron tube in the airborne unit of TACAN, a military and commercial aerial navigation system.

As in all TACAN components, this mating part must be readily *interchangeable* in case of component failure. So Federal Telephone and Radio Company, a Division of International Telephone and Telegraph Corporation, turned to their Standards Laboratory *before* starting production.

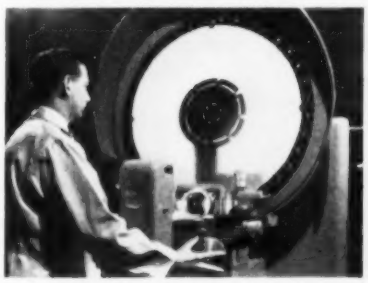
The heater and cathode contact ring was *optically* inspected—on a Kodak Model 30 Contour Projector. After analyzing the results, minor changes in tooling were suggested. Result: a perfectly matched part, completely concentric and interchangeable.

Whatever you're inspecting . . . Whether it's tools, gages, dies, electrical or mechanical components, the Kodak Model 30 Contour Projector provides you with a projected image that's as *free* from distortion as the science of optics will permit . . . *accuracy* across the entire face of the big, 30-inch screen. Images are sharp, high-contrast; erect and unreversed at all magnifications. Changes in magnification can be made at the flick of a switch.

More refinements . . . You also get efficient head-on surface illumination and a full 16″ throat clearance between collimator lens and front mirror. This clearance is constant at all magnifications, permits staging of large parts without repositioning.

The many other advanced refinements, extreme optical stability, and rugged construction of the Model 30 Kodak Contour Projector make it a leading choice for large-screen precision micrometry or routine gaging.

Cut inspection costs . . . Along with accuracy, optical gaging with Kodak Contour Projectors offers you savings in gage costs, increased inspection rates, and the economies that result from a minimum of operator training. You can use optical gaging almost anywhere in your plant . . . receiving, assembly, production, inspection, toolroom. There are 6 Kodak Contour Projectors to choose from, one matched to your inspection needs. Get all the facts by writing for our detailed catalog.



At the ITT Standards Laboratory, the Kodak Model 30 Contour Projector provides the accuracy needed for testing and servicing master mechanical and electrical measuring devices.

Special Products Sales

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

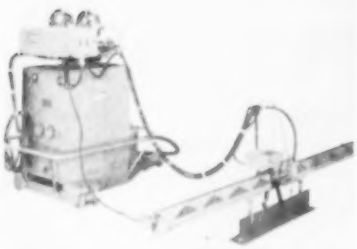
the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

½ in. in both single end and double end types are carried in stock, as are two-tooth mills in the single end type from ¼ to ⅜ in., and double end from ⅛ to ⅜ in.

Pratt and Whitney Co, Inc, West Hartford 1, Conn

MORE DATA? Circle 81, inside back cover



Twin Fillet Machine Automatically Welds Structures Corner to Corner

This new twin fillet machine carriage makes possible automatic welding of stiffeners, flanges, and other structural components from corner to corner, eliminating the manual welding formerly required.

The aluminum machine carriage and power supply has dual automatic wire feeds and a speed range of 0-60 ipm. Two dc constant voltage, three-phase welding machines rated at 500 amps are enclosed in one console.

Units are available for submerged melt, inert arc, and other consumable welding processes.

L and B Welding Equipment, Inc, 2424 6th St, Berkeley, Calif

MORE DATA? Circle 82, inside back cover

DRILL TORQUE BOOSTER provides five times normal torque, giving a ¼-in. drill almost the capacity of a ½-in. drill. Hand controlled, this unit will perfom tapping or reaming operations or can be equipped with a hole saw—*Grip-Torc Tools, 17480 Shelburne Way, Los Gatos, Calif*

MORE DATA? Circle 83, inside back cover

Low-Cost 17-in. Drill Press Available in 75 Models

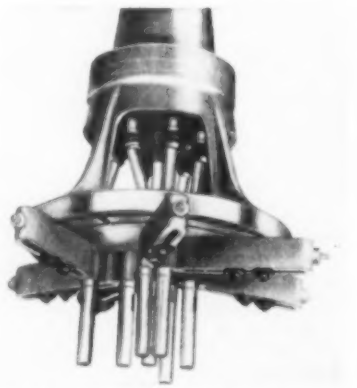
Low-cost 17-in. drill press, available in 75 models, is designed for flexible production tooling. Model variations include: floor or bench models, standard or power feed, single or multiple spindles, high or low speed, standard tilting or production type table, and ½-in. key chuck or No. 2 Morse taper spindle.

Other features are inverted double spindle design, wrap-around head design, and a depth scale which can be set to read from zero when the drill contacts the work.

Capacities are ¾-in. dia hole in cast iron and ⅝-in. in steel.

Rockwell Mfg Co, Walker-Turner Div, Dept 1005, 400 N Lexington Ave, Pittsburgh 8, Penna

MORE DATA? Circle 84, inside back cover



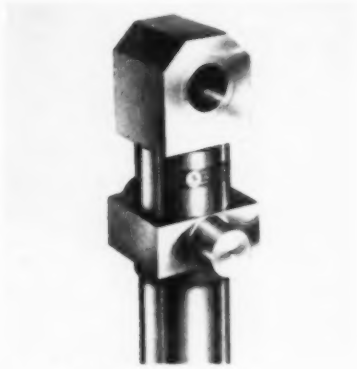
Multi-spindle Drill Heads Have Two-Bolt Spindle Arm Mounting

This adjustable multi-spindle drill head converts any single spindle drilling machine for single-pass, multi-hole work. Features include two-bolt spindle arm mounting, snap-in universals, hardened gears running in oil bath, outer end Zerk fittings, and steel reinforced hood.

The drill head can be used for drilling tapping, reaming, counter-sinking, and counterboring—in a circle, straight line, or random pattern. Centers can be as close as 11/16 in. with minimum close centers of ½ in. also available.

Cleveland Pneumatic Industries, Inc, 64 Old Orchard, Skokie, Ill

MORE DATA? Circle 85, inside back cover



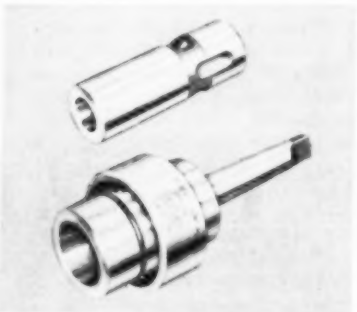
Liquid Springs Absorb or Store 1,000,000 lbs Force

Heavy duty Series 900 Liquid Spring Shocs using liquid compressibility will absorb or store up to 1,000,000 lbs force, in both directions.

These liquid springs, which may be equipped with any type of standard end mountings, are available in 2 to 5-in. dia with up to 2-in. stroke. They are available with adjustable dampening force and time delay return, and can be made in other diameters and strokes on special order.

Taylor Devices, Inc, 188 Main St, N Tonawanda, NY

MORE DATA? Circle 86, inside back cover



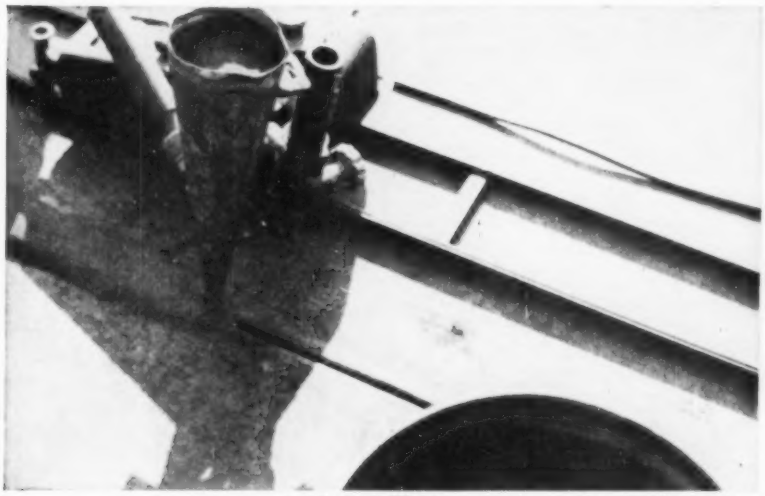
Quick-Change Toolholder Speeds Drilling, Reaming, Tapping

Known as the Magic Chuck, this quick-change toolholder is especially valuable where operations such as drilling, reaming and tapping are done in succession. Raising a locking

Lincoln

WELDYNAMICS

NEWS ABOUT ARC WELDING AT WORK CUTTING COSTS



A "Squirt" Welder welds heavy plate in 1/4 the time.

WAR AGAINST HIGH COSTS NETS BARGE BUILDER 75% BONUS

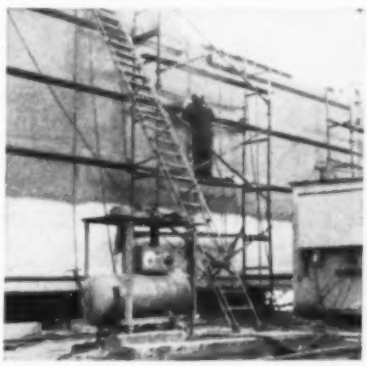
The Wiley Manufacturing Company of Fort Deposit, Maryland, builder of welded barges and large custom built cranes, initiated a cost reduction program that resulted in real savings.

Stanley Welsh, general superintendent, and J. J. Evans, general foreman, faced with ever rising labor costs, decided bold action was necessary if the company was to keep prices competitive. Since welding is the largest single operation in the Wiley yards it was only logical that they should look for a way to reduce welding costs first.

Enlisting the aid of Joe Gulley, a Lincoln welding engineer out of Lincoln's Baltimore office, the Wiley men began a detailed survey of their welding procedures and processes.

Mr. Gulley assisted Mr. Evans and his weldors to analyze the methods and electrodes used for welding sub-assemblies and for joining the sub-assemblies to the main structure. It was found that by positioning the smaller units iron-powder Jetweld electrodes could be used and speed increased considerably.

The jack-pot, though, was won by switching to semi-automatic for welding of heavy plate. By using a Lincoln "Squirt" welder propelled on a gas cutting buggy, Wiley is able to weld heavy plate, up to $\frac{3}{4}$ inch, in $\frac{1}{4}$ the arc time previously required to weld it manually.



Welded units form the barge on the ways.

Structural members are fabricated on the ground with Jetweld, then welded into sub-assemblies.

Jack Evans, General Foreman at Wiley, sparked a cost reduction program that succeeded.

Mr. Evans states that these savings are made even greater because very little plate preparation is necessary. Bevel is eliminated in plate up to $\frac{1}{2}$" and weld cleaning is greatly simplified. The resulting welds are better, too, than can be made manually.

The result—a 75% saving in arc time on this operation!

Although no overall cost figures were immediately available, Mr. Evans estimated that they had been able to reduce total welding costs by at least one third.

The LINCOLN ELECTRIC CO.

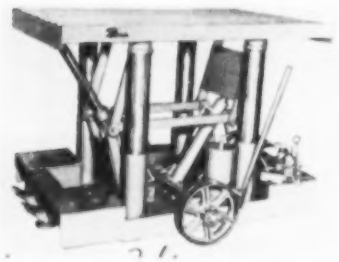
Dept. 2031, Cleveland 17, Ohio
The World's Largest Manufacturer
of Arc Welding Equipment

ring releases the collet and its tool. A new collet is inserted and is locked in place by letting the ring drop over the chuck. The ring locks the collet in the chuck and provides a positive drive through two balls which are held in the collet recesses by the ring.

Chuck is made in five sizes with ASA or Morse Taper shanks and with holes to accommodate collets from 11/16 to 2⅜ in. OD. Collets have standard tapered holes. Others are available with straight holes up to ½ in. for taps, reamers, etc, that have square ends. Blank and special collets are also available.

Seibert & Sons, Inc, Chenoa, Ill

MORE DATA? Circle 87, inside back cover



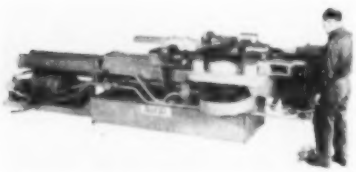
Hydraulic Lift Tables Have Capacities up to 5000 lbs

Hydraulic lift tables in capacities up to 5,000 lbs have been developed for shops handling heavy dies and equipment in and out of presses and machines.

Tables feature steel welded construction with 2-in. thick rail type top, 44-in. length, 30-in. width, 18-in. low, 32-in. high, with double-acting hydraulic cylinders, four-way valve, and built-in stabilizers.

Lexco Engineering and Mfg Corp, 20 W Chestnut St, Souderton, Penna

MORE DATA? Circle 88, inside back cover



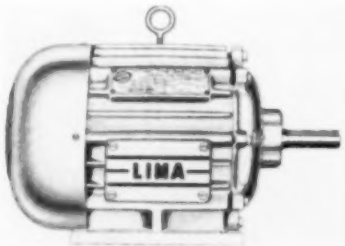
Rebar Bender Processes Bars To 2⅜-in. Round Capacity

Model 92 bends reinforcement bars at rate of approximately 7 rpm. Power of the twin-cylinder drive is transferred to the shaft by extra-strength roller chain. Twin cyinders guarantee equal force for bending in either direction. It is not necessary to turn the bar end for end in making double offset bends. Speed control valve is also provided.

Unit has a foot-operated electric control with two pedals, one for right, the other for left-hand bending. A degree of bend selector has four adjustable stops in each direction of rotation. Stops can be preset for desired angles of bend. A 30-hp motor may be wired for either 220 or 440-v, 3-phase, 60-c ac. Electrical control circuit is 110 v. Floor space is 48 in. by 17 ft 5 in.

Wallace Supplies Mfg Co, 1304 Diversey Pkwy, Chicago 14, Ill

MORE DATA? Circle 89, inside back cover



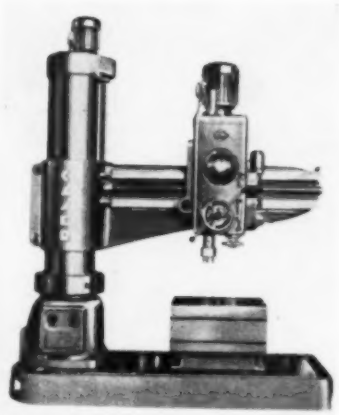
Lima Introduces New Line Of Totally-Enclosed Motors

New line of Lima Type E totally-enclosed fan-cooled motors are for use in non-explosive atmospheres containing excessive moisture or abnormal quantities of dirt, metallic dust or other abrasives.

The motors are available from 1 hp, 900 rpm, frame 213, through 40 hp, 3600 rpm, frame 326 U, (rerated NEMA).

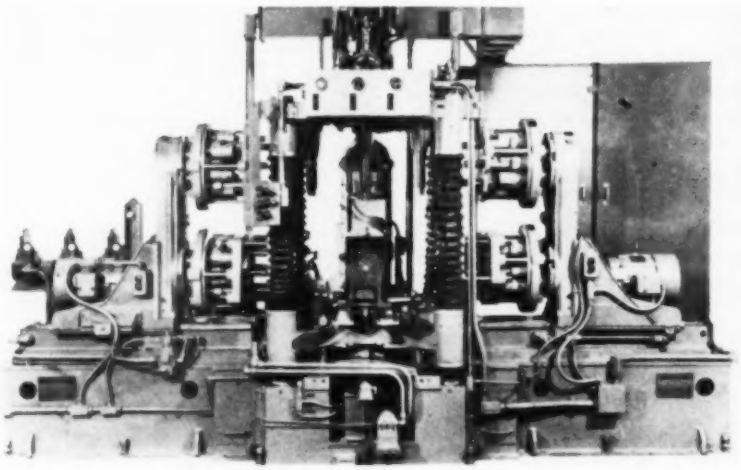
Lima Electric Motor Co, Inc, Dept 132, Lima, Ohio

MORE DATA? Circle 90, inside back cover



French Radial Drill Available With 5-ft Arm, 14-in. Column

Latest addition to the Caser (French) line is this 5-ft arm, 14-in. column radial drill, known as Model F 40.



TEN DIFFERENT SIZES OF MOTOR FRAME BRACKETS are machined on this four-way vertical indexing drilling and tapping machine, which features a 20-in. square fixture mounting area that raises and lowers automatically to various machining stations. Using three 12-in. way type hydraulic drill units and an Air-Oil-Matic drill unit equipped with a turret head, the machine makes 21 drilling and 21 tapping operations in one completely automatic cycle latsting 30.5 seconds—*Morris Machine Tool Co, 2011 Eastern Ave, Cincinnati*

MORE DATA? Circle 91, inside back cover

Would your grinders have met these tolerances?

One ten-thousandths on diameter; 50 millionths total runout; 2 to 3 R. M. S. finish . . . tolerances that Peninsula Tool Co., San Carlos, Calif., *had* to hold on production runs for a well known manufacturer of ultra-sensitive tape recorders! After every grinding company on the West Coast had failed, Peninsula did it . . . because, as Peninsula Tool states, the job was put on *Rivett 1024 Grinders!*

Send for catalog 1024B and learn how this famous grinder does toolroom quality on a production basis . . . switches quickly from internal to external . . . really saving time and cutting costs!

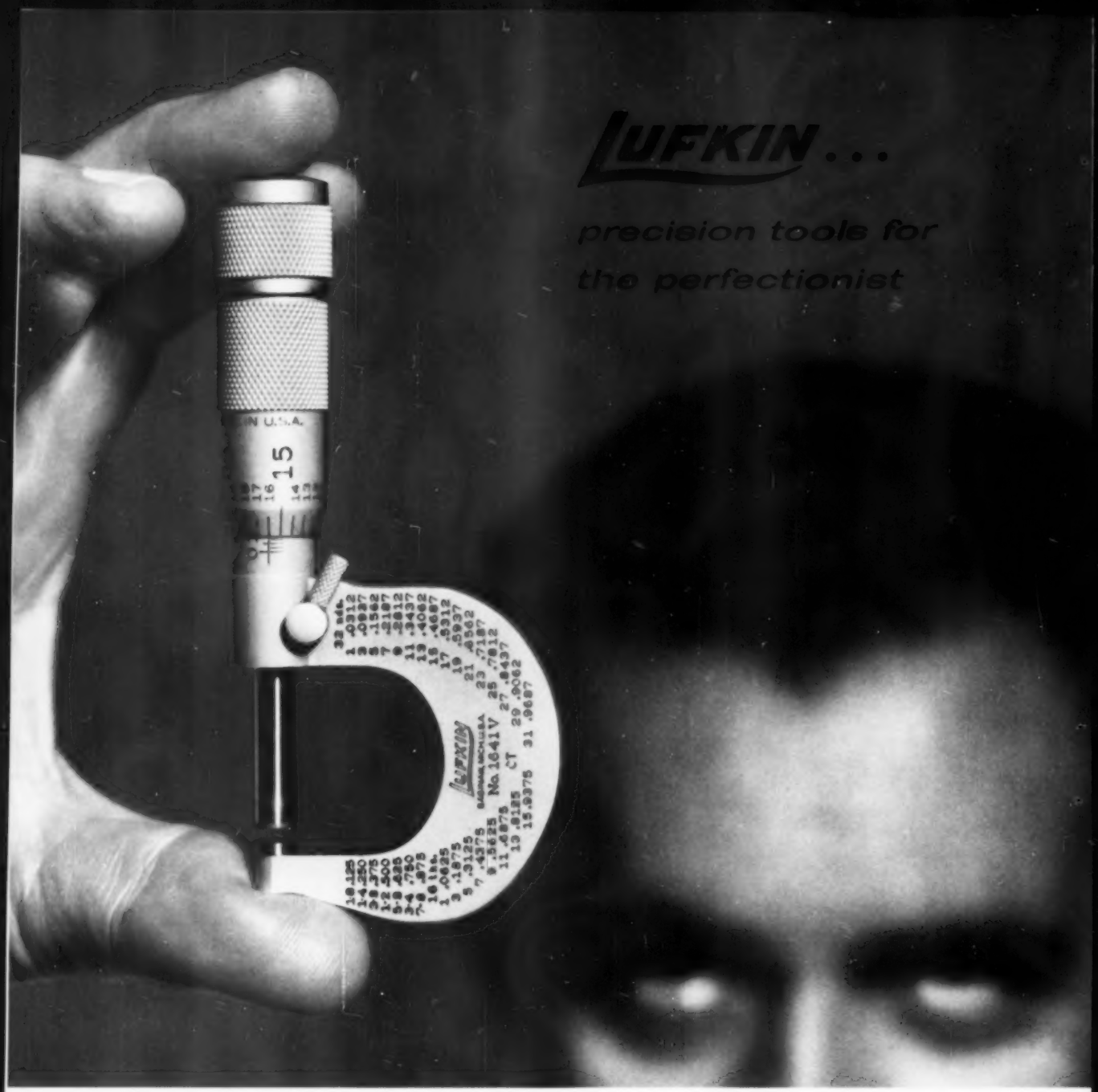
RIVETT LATHE & GRINDER, INC.
Dept. AM-4, Brighton 35, Boston, Massachusetts

Rivett 1024 Internal and Universal Grinder

You can keep this grinder always busy! Do any number of internal jobs and then switch over to external work. It has all the features of a true internal grinder—extra-long table moves sufficiently to left to permit plug gauging to 6" depth without retracting wheelhead slide. Both spindles are flange mounted in massive wheelhead which swivels full 180° for quick conversion! Grinds any hole to 9" dia., externally to 12" dia.

RIVETT
INTERNAL & UNIVERSAL GRINDERS

CIRCLE 282 READER SERVICE CARD



Eliminates guessing and squinting

Bigger Barrel. Graduations are farther apart. Numbers are larger for fast, accurate reading.

Exclusive Cam Lock. A flick of the thumb locks setting. Prevents costly reading errors.

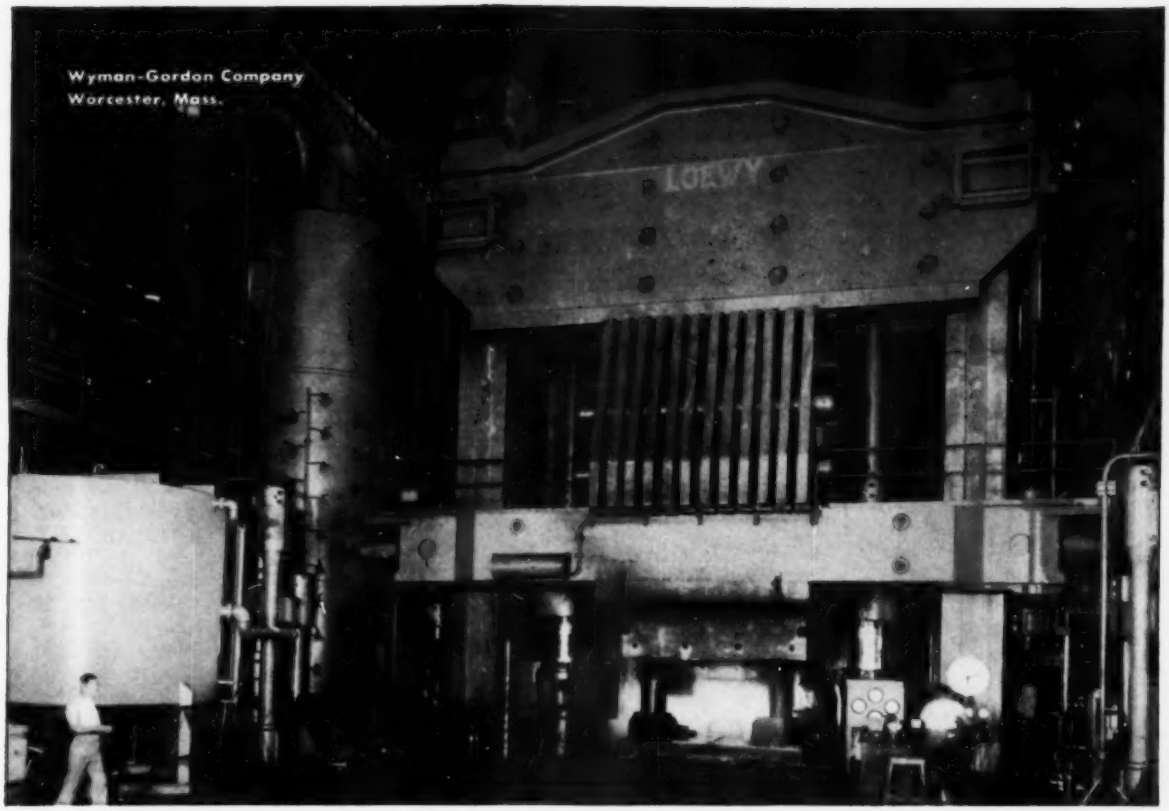
Simple Adjustment. Takes only a few minutes. Reading line always stays in original position.

Chrome Clad® Finish. Black-filled markings contrast with nonglaring chrome for easier reading in any type of light.

Always buy from your Lufkin distributor. He knows precision tools. His stock is maintained to fit your needs. He is always ready to give you prompt and reliable service.

LUFKIN MICROMETERS

TAPES RULES PRECISION TOOLS



Operation Big Squeeze:

World's largest presses lubricated by Cities Service Pacemaker Hydraulic Oils

Once a forging operation for horse-drawn carriages, Wyman-Gordon Company now operates the world's largest presses, with the newest one capable of exerting 50,000 tons pressure.

Reason for this tremendous press is the increasing need for strong, lightweight metal parts for aircraft. Today, as for many years, no military or transport aircraft takes to the air without Wyman-Gordon forgings.

With its huge, hydraulically operated presses, Wyman-Gordon is able to forge huge pieces with one big squeeze. Sometimes a whole unit for a landing-gear strut. Or one mammoth wing spar.

The press that exerts 50,000 tons pressure is described by Wyman-Gordon as "the largest single machine ever conceived"—and few people would argue the point after seeing it.

Mounted in a pit that extends nine stories beneath the earth, the giant press is over 114 feet high and weighs 10,605 tons, 6,450 of which moves up and down.

Cities Service is justifiably proud that here as in all of Wyman-Gordon's presses with 18,000 tons pressure or better, hydraulic lubrication is provided by Cities Service Pacemaker Oils.

It is hardly necessary to point out the incredible demands that such machinery makes of its hydraulic lubricants... and certainly it is self-evident that if Cities Service Pacemaker Oils can perform satisfactorily in the world's largest presses, they'll do the same for you. Talk with a nearby Cities Service Lubrication Engineer. Or write: Cities Service Oil Co., Sixty Wall Tower, New York 5, N. Y.

Entire Rig Is Operated by One Man with the few simple controls shown here. With a flick of his fingers he can put on a squeeze of 50,000 tons. Result is extremely strong lightweight forgings for aircraft.

Lubrication Foreman has mammoth responsibility. Here, he checks dispenser for Cities Service EP 20 Lubricant... used on main bed and columns of large presses and other areas subject to extreme pressures.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

◄ CIRCLE 283 READER SERVICE CARD

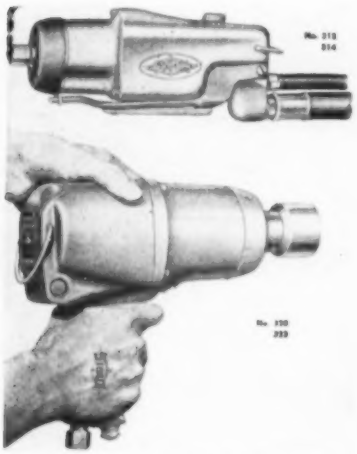
CIRCLE 284 READER SERVICE CARD

It features single pushbutton clamping of column and head power elevation of arm by directional lever, single control for spindle start, stop and reverse combined with pre-selection of the 14 available spindle speeds ranging from 32 to 2100 rpm, and 8 spindle feeds from 0.08 to 0.7 in. per revolution selected with running machine.

It also has safety stops all around, feed dial with direct reading and automatic depth setting, and No. 4 Morse taper in spindle.

Distributed by Hermes Machine Tool Co, Inc, 48-15 Northen Blvd, LIC 1, NY

MORE DATA? Circle 92, inside back cover



Air and Electric Impact Wrenches Introduced in Twelve New Models

Sioux line of air impact wrenches and air screwdrivers has been expanded with addition of seven new models. Five new models have been added to the line of electric impact wrenches and screwdrivers.

Smallest of the air wrenches is the production type No. 313 and 314. The 2¾-lb unit delivers 95 ft-lb of torque and incorporates a new remote air exhaust system which carries exhausting air and oil 6 ft away from the operator. Large Model 322 delivers 1200 ft-lb of torque with 120 lbs of air pressure at the tool.

Albertson & Co, Sioux City, Iowa

MORE DATA? Circle 93, inside back cover

Heat-Treating Furnace Control Maintains Close Time, Temp Range

Electronic device is said to assure a foolproof system of maintaining tight, uniform time and temperature controls in heat-treating furnaces. It is centered about an electronic timer that can be preset for both time and temperature through two phases of the heat-treating process.

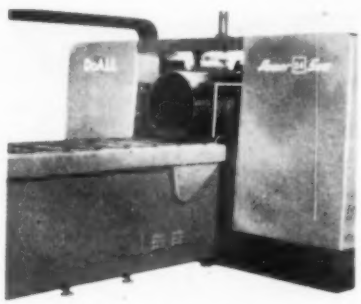
The control system, called rationed heat energy, has the advantages of tamper-proof settings, fuel cost savings, finer degree of equilibrium in heating, greater uniformity of heat penetration, minimizing work distortion, and eliminating thermocouple failure.

According to the manufacturer, these factors are particularly important when the furnace is zoned to handle several time cycles and temperature levels for heat treating a component of varying geometries and dimensions.

Instrumentation can be adapted to any conventional heat-treating furnace now in use.

A F Holden Co, 14341 Schaerfer Highway-AR, Detroit 27, Mich

MORE DATA? Circle 94, inside back cover



Horizontal Band Saw Features Variety of Work Handling Devices

Model C-24, a heavy duty horizontal power saw that cuts with the top portion of the saw band, is now available with a selection of work handling devices.

The basic model has a 24 by 24-in. capacity cutting head, main vise, hydraulic system, coolant system and movable control console. A 15-hp drive powers the steel saw band at speeds ranging from 20 to 200 fpm.

Each basic machine includes a roller table on the load side of the saw band with or without powered rollers. Up to 60 ft of powered conveyer tables can be added to both the load and unload side of the basic machine, and additional runout tables can be added to the motorized units.

An optional outboard vise permits work to be held from either side of the saw band.

DoAll Co, Des Plaines, Ill

MORE DATA? Circle 95, inside back cover

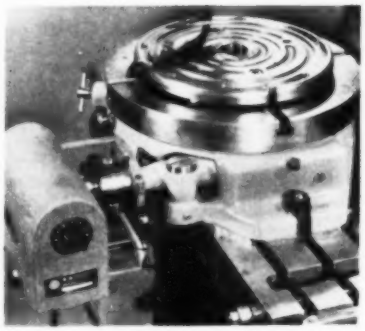
Electronic Bearing Tester Locates Faults As Small As One-millionth

This instrument detects and pinpoints hidden faults one-millionth of an inch in size, without bearing disassembly. Bearings may be tested with or without grease, oil, or seals, and new bearings need not be cleaned before testing.

Oscilloscope display combined with audible signal and simple dial settings make possible reliable operation of the Model BA-22 by relatively untrained personnel. Radial or thrust-type bearings may be tested under load conditions in either the vertical or horizontal plane. Ball and roller bearings up to 14-in. dia are checked with accuracy surpassing any other known method, according to the manufacturer.

Bearing Inspection, Inc, 3311 E Gage Ave, Huntington Park, Calif

MORE DATA? Circle 96, inside back cover



POWER ATTACHMENT for rotary milling tables, tradenamed Roto-Torque, can be installed on hand feed tables in less than a minute, according to the manufacturer. It is reported that the power feed provides a smoother finish on special form work—radiuses contours, cams and the like—and makes much of the hand polishing unnecessary—*M & M Tool Mfg Co, 1124 E Third St, Dayton 2, Ohio*

MORE DATA? Circle 97, inside back cover

IT PAYS TO STANDARDIZE ON **STANSCREW**

Stanscrew *standard* fastener does *special* job on free-wheeling hubs for "Jeep"

Attaching POWER-LOCK free-wheeling hubs to Willy's 4-wheel drive "Jeeps" calls for something pretty "special" in fasteners.

To begin, the fasteners must be tough and dependable . . . must have the ability to stand up under the punishment that is normal for an "off the road" vehicle. Since these hubs are sold separately, the fasteners also must present an appearance that builds consumer appeal. And they must be completely uniform to facilitate installation.

The Cutlas Tool and Manufacturing Company, Lyons, Ill., manufacturers of this Willys approved accessory, outlined the problem to a Stanscrew fastener specialist. He recommended Stanscrew's heat-treated cap screws with the extra toughness resulting from "Carbon Restoration" . . . cadmium plated for greater consumer appeal and higher corrosion resistance . . . and produced in an unusual length to precisely meet all the requirements for installation on Willy's "Jeep" vehicles.

Thus, by slightly modifying one of the more than 4,000 standard fasteners in Stanscrew's complete line, this specialist was able to supply a fastener which eliminated the necessity for a costly special.

Quite possibly your Stanscrew fastener specialist can do the same for you. He can bring to your problem years of specialized experience, and the services of an outstanding engineering staff. And he can make recommendations from a complete line . . . always in stock, quickly available.

So for the answer to your "special" fastener problem, just call your Stanscrew distributor today. He will arrange for a meeting with the Stanscrew fastener specialist in the very near future.

STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

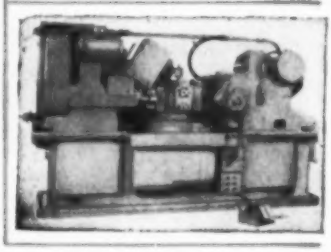
STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

CIRCLE 285 READER SERVICE CARD

Single set-up covering
ALL finishing operations...

MEANS GREATER ACCURACY *with* **GOSS DeLEEUW**

AUTOMATIC CHUCKING MACHINES



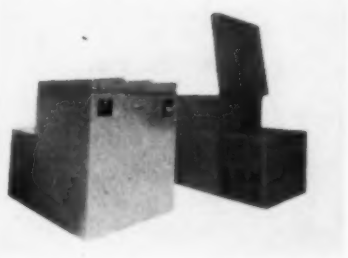
One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.



Self-Contained Water Quench Tank Is Mechanically Refrigerated

This Model WE-50-34 refrigerated water quench tank is a self-contained unit with sufficient mechanical refrigeration capacity to lower the temperature of 50 lb of aluminum parts or rivets from 1000 F to 34 F in 90 seconds. It has an air-lift, top-opening lid and a 37-in.-dia by 57-in.-high tank. Outside cabinet dimensions are 48 x 48 in.

A similar unit, the WE-50-28S, is designed for use as an alcohol quench tank, and is capable of lowering the temperature of the same load from 34 F to 28 F in 90 seconds. Power requirements for both models are 220/440 volts, single or 3-phase, 60 cycle.

Webber Corp, Dept QT-287, PO Box 217, Indianapolis, Ind

MORE DATA? Circle 98, inside back cover

Lincoln Introduces New Line Of Manual Arc Welders

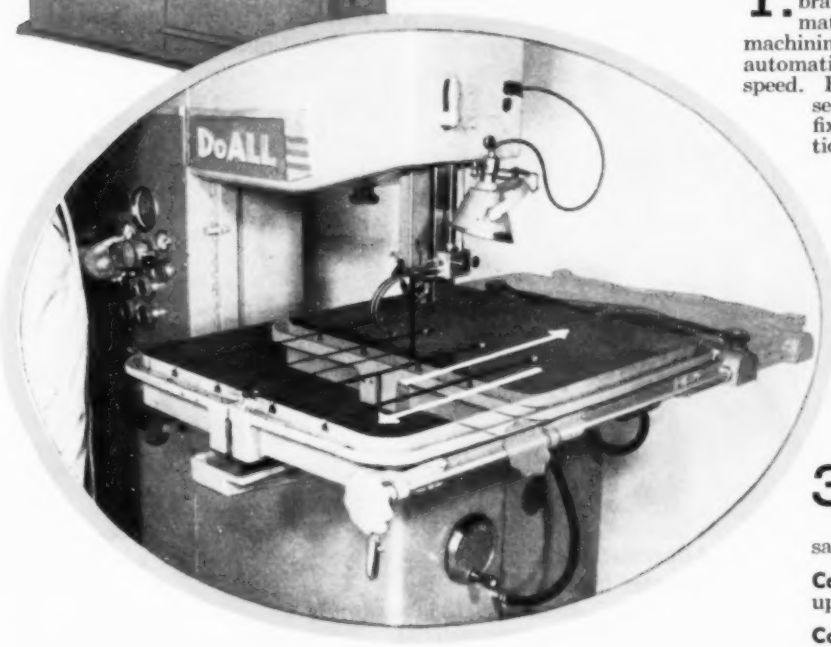
Welders, called TM Idealarc, are available either as ac transformer units or combination ac and dc rectifier models. They have a mechanical, movable core reactor type of current control and are made in NEMA rated 300, 400, 500, and 650-amp sizes.

In addition to choice between ac and ac/dc, optional features from which to select, depending on requirements of the application, include remote control of current and

RE-EVALUATE your BAND SAWING

SEE Contour-matic® MACHINES

Model 26-3
One of a complete series
of Contour-matics



1. **New Power Work Table** with calibrated work fixture on the Contour-matic removes the labor from band machining. Smooth-operating controls automatically coordinate feed and tool speed. Result: band sawing becomes semiautomatic with little or no fixturing for toolroom or production runs.

2. **New Cutting Tool** is the high-speed steel Demon* saw band. Its phenomenal properties permit performance that is 30 times longer than ordinary carbon steel blades. Tooth sharpness is retained at high temperatures, thus permitting heavy feeds at higher tool velocities to give maximum cutting rates and tool life.

3. **New Cutting Rates**—up 650%.

Accuracy—held within thousandths.

Capacity—table feeds heavy work up to 1,000 lb.

Coolant—mist or flood for extended tool life at maximum sawing rates.

New Concepts of Band Machining Economy and Versatility

Contour-matic band machines are different. There is nothing else like them in the machining world. For machine tool replacements or additions, Contour-matics open new possibilities for the reducing of machining costs.

It is the choice of production personnel and methods engineers who have evaluated the band machining method. They find Contour-matics are their best machine tool investment.

Do what others are doing—question your band sawing and other machining methods by asking, "Can it be done on a Contour-matic?" Just call your local DoALL store for a free demonstration right in your own plant . . . or write.

B-56

FREE—"Job Spotting" Service

For your evaluation—illustrated case histories of job savings made by the Contour-matics over former methods will be mailed to you periodically. Send us your name on company letterhead.

Reg. T. M. The DoALL Company

THIS IS A
TYPICAL DoALL STORE

The DoALL Company, Des Plaines, Illinois

Discover

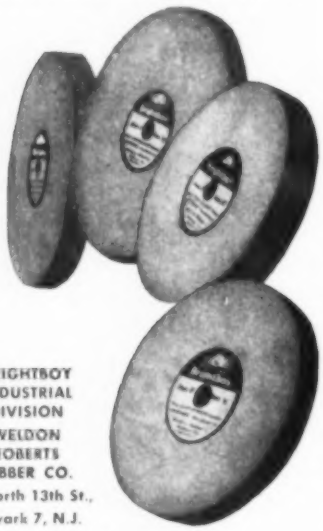
The Broad, New Applications

of TIME-SAVING, MODERN ABRASIVES!

Brightboy, the only complete STOCK line of rubber-bonded abrasives, performs many types of work not previously associated with abrasives. Unique rubber-and-abrasive action BURRS, CLEANS, FINISHES, POLISHES, in a single-step operation. Aluminum Oxide and Silicon Carbide grains and textures, grades extra fine to extra coarse, in soft, firm and tough rubber binders.

WRITE us NOW for:

- SAMPLE BRIGHTBOY HAND TABLET
- CATALOG LISTING GRAINS, TEXTURES, MACHINE SPEEDS
- NEW METHOD RECOMMENDATIONS, and name of nearest Brightboy distributor



BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th St., Newark 7, N.J.

America's Pioneer Manufacturer of Rubber-Bonded Abrasives

WELDON ROBERTS
Brightboy
RUBBER CUSHIONED ABRASIVES

polarity; a low voltage contactor that reduces open circuit voltage when machine is on but not welding; a line contactor (starter) with overload protection and either a line or 115-v pushbutton; an arc booster that provides a current surge during arc striking; or power factor correction condensers. All optional features mount inside the welder.

Machines are reported to have a safe 73-v open circuit voltage, yet produce a very stable arc even with low ac amperage and difficult-to-use electrodes. Prices begin at $245 for the basic 300-amp ac welder and $510 for the basic 300-amp ac/dc unit.

Lincoln Electric Co, Cleveland 17, Ohio

MORE DATA? Circle 99, inside back cover

Hand-Operated Shear Incorporates Inclined Ram

Di-Acro 36-in. shear, designed to process most types of sheet material, is said to have a combination eccentric-leverage operation that provides much greater mechanical advantage than is possible with a shear operated by leverage only. Inclined ram allows shear blades to be set at such an angle that only the edge is in contact with the material, thus reducing shearing force or pressure. Material as heavy as 16-gage mild steel can be cut across the 36-in. width. Inclined ram approach also helps to counteract thrust and keep shear blades straight, according to manufacturer. Ram eccentrics are mounted back from centerline to hold the ram against guides. A downward and backward pull keeps ram housing against the guides and allows an accurate close blade clearance with resultant die accuracy in shearing.

O'Neil-Irwin Mfg Co, 512 Eighth Ave, Lake City, Minn

MORE DATA? Circle 100, inside back cover

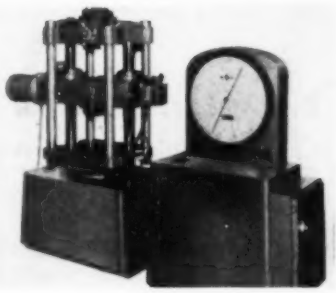
Abrasive Belt Polishing Head Speeds Finishing Operations

UP-2 head, designed for use on Hammond OK, RL, and ROL polishing lathes, offers the advantages of contact wheel, free belt and platen grinding and finishing, and makes it possible to polish and buff economically on one machine. Head is recommended for light to medium duty polishing operations and can be furnished on either or both sides of the lathe.

Spindle speed of 1750 rpm gives 5500 sfm using a 12-in. dia contact wheel. Upper idler pulley assembly is adjustable so belts from 52 to 90 in. in length can be used. Belt width can be from 1 to 2½ in. Belt guard and dust scoop with exhaust outlet are furnished with the head.

Hammond Machinery Builders, 1618 Douglas Ave, Kalamazoo, Mich

MORE DATA? Circle 101, inside back cover



High-Speed Machine Designed For Production Testing

Standard steel specimens can be tested in rapid sequence with the new automatic Super L universal testing machine. Standard 400,000-lb capacity model has a second range of 200,000 lbs; range can be changed during test.

In operation, specimen is inserted quickly and held by air-operated grips. Load is applied at any speed

THE *BEST* MACHINES MAKE THE *BEST* GEARS

Illustrated is our latest Grinder for Spur and Helical Gears up to 72" diameter . . . ultra precision work table, accurate to 4.3 arc seconds total accumulative error . . . THIS MACHINE IS THE MOST ACCURATE LARGE GEAR GRINDER IN AMERICA . . . Ultra High Precision Gears ground on this machine open new horizons of accuracy and performance of Large Gearing for Radar, Marine, Turbine, Jet Engines, Diesel Engines, High Speed Shears and many similar applications . . . Phillie Gear has 5 additional High Precision Gear Grinders.

In addition to 66 years experience and 3 large modern plants, Phillie Gear has the World's latest and finest machines for producing gears of all types and sizes, in any quantity . . . Special attention is given to selection of materials, machining, heat treatment, and tolerances -- all with one thing in mind: to give you the *Highest Quality Possible.*

All gears made by us are checked and tested on the very latest machines — and then must pass the most rigorous inspection by specially trained men, before shipment — There is no "guesswork" at Phillie Gear.

Send for our latest 76 page "Gear Book" — it's practically a treatise on the subject of gears . . . Please use your Business Letterhead when requesting a copy.

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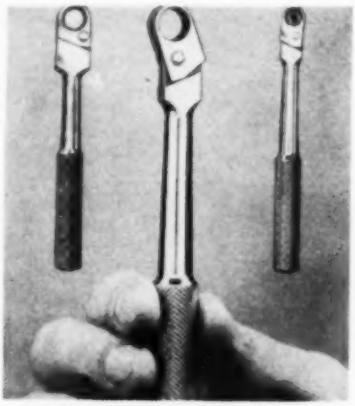
Virginia Gear & Machine Corp. • Lynchburg, Va.

from 0-6 in. per minute. When specimen fractures, machine unloads at speed of 20 ipm. Max load is indicated on the large, illuminated dial by a lazy pointer. Hydraulic loading system incorporates an auxiliary pressure system for max piston stability.

Tinius Olsen Testing Machine Co, 835 Easton Rd, Willow Grove, Penna

MORE DATA? Circle 102, inside back cover



Small Ratchet Wrench Fits Tight Assembly, Repair Spots

This small ratchet wrench has been developed for close-clearance operations and should prove especially useful in the aircraft and automotive industries, according to the manufacturer.

The outside diameter of the wrench head does not exceed the diameter of the head flange on a 12-point screw, which means there is no overlap to interfere when working in tight places. A tool is also available for hex-head bolts and nuts.

Milbar Corp, 1900 Euclid Ave, Cleveland 15, Ohio

MORE DATA? Circle 103, inside back cover

Extensions Designed For Machine Tapping

Line of tap extensions, designed specifically for machine tapping operations, is available for standard taps in sizes from No. 0-80 to ½-in. —20.

These Style B tap extensions come

$40 mist-spray cooling outfit lets you hold closer tolerances

Swivel tip directs fine mist spray into the critical point of cut.

Multi-Misters available with one- or five-gallon tanks, one to four nozzles.

When cutting-tool heat plays havoc with tolerances, control it *effectively* with the DeVilbiss Multi-Mister.

Multi-Mister's jet of expanding air dissipates tool heat instantly; its spray mist lubricates cutting edges to reduce friction.

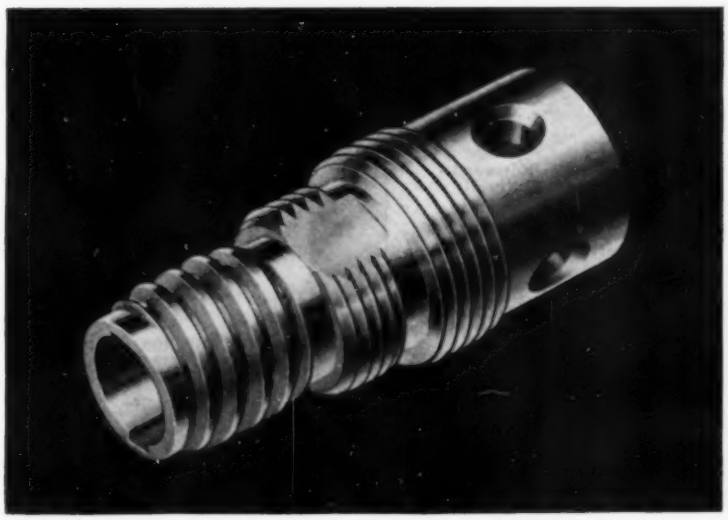
The results are a matter of record. For, in actual use, the Multi-Mister has made possible greater machine speeds, finer surface finishes while holding closer dimensional tolerances —with fewer shutdowns to sharpen and reset tools. And it often doubles tool life! Complete outfits start at $40; attach quickly and easily to any machine.

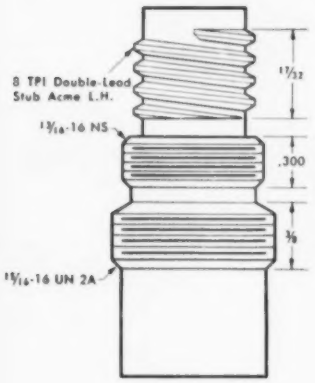
Call your DeVilbiss supplier, today, for full details; or write us direct for Multi-Mister Bulletin BC 1025.

THE DEVILBISS COMPANY
Toledo 1, Ohio
Barrie, Ontario • London, England • São Paulo, Brazil
BRANCH OFFICES IN PRINCIPAL CITIES

FOR BETTER SERVICE, BUY
DEVILBISS

COST CUTTING on tough jobs—like rolling a double-lead Stub Acme thread—may be easier than you think. Olson Mfg. Co. needed only a minor adjustment in a standard Anaconda rod

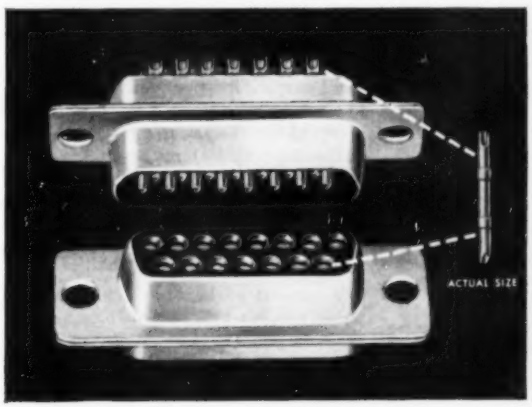


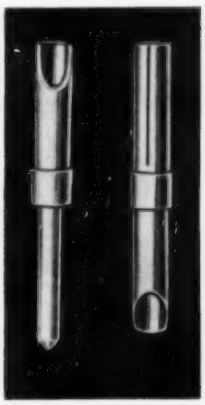


Rolling three threads *(drawing, right)* in two positions on a 6-spindle automatic meant cost savings for Olson Mfg. Co., Worcester, Mass. The Acme thread, however, posed problems. American Brass specialists suggested minor modification of standard Anaconda Free-Cutting Brass Rod to provide the extra ductility needed. The idea worked and the resulting valve spindle is shown above, about 1½ times actual size.

—or maybe you need a different alloy rod. The tiny connectors, right, have to be machined from .078" rod, requiring many precision form-cutting, drilling, slotting operations. So machinability is a vital property of the rod used—but so are adequate electrical conductivity, high strength, and fatigue resistance.

Cannon Electric, Los Angeles, makers of these electrical plug assemblies, had to find a rod with a delicately balanced combination of mechanical properties to provide the unfailing and continuous performance required. They found it in Anaconda Free-Cutting Phosphor Bronze-610 Rod, developed by American Brass metallurgists to combine the strength, resilience, fatigue resistance of phosphor bronze, and machinability approaching that of free-cutting brass.





MEETING the joint requirements of designers, manufacturing men, and buyers—to achieve high quality and performance while simplifying fabrication and cutting over-all costs—is an important function of American Brass technical specialists. For imaginative and practical help of this kind, see your American Brass Company representative or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

ANACONDA®

COPPER · BRASS · BRONZE
NICKEL SILVER · MILL PRODUCTS
Made by The American Brass Company

CIRCLE 291 READER SERVICE CARD

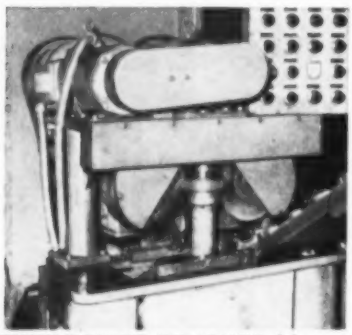
OSBORN

BEFORE BRUSHING — Automotive clutch component . . . with sharp edges plus fine machining chips and burrs still carried inside teeth.

AFTER BRUSHING — Edges and surface junctures are uniformly precision blended. Chips and burrs are thoroughly removed to help assure troublefree operation of the installed part.

Precision finish . . . in 7 seconds flat

. . . capacity 360 parts-per-hour with OSBORN Power Brushing



TWIN POWER BRUSHES deburr and edge-blend these parts on 7-second cycles. Osborn 6" Monitors Brushes—operating at 1750 rpm—do the job at high production rates. Quality is excellent . . . cost is low.

IF you precision finish parts, and want to do the job faster . . . with improved quality . . at less cost—today's Osborn Power Brushing methods can help you do it.

For example—this leading automotive parts manufacturer uses a dual-brush setup to automatically deburr and edge-blend precision clutch parts. In addition to the *versatility* and *precise quality control* he's afforded by Osborn Power Brushing—he finds finishing operations are done faster and at significantly lower cost.

It's typical of how *you* can pinpoint savings, too. An **O**sborn **B**rushing **A**nalysis—made in your plant at no cost or obligation—is the first step. Write us for full details. *The Osborn Manufacturing Company, Dept. C-82, Cleveland 14, Ohio.*

Osborn Brushes

BRUSHING MACHINES • BRUSHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

in sets of nine, which will lengthen taps from 8 to 28¼ in. They can also be used for hand tapping and are available as individual units, each eight inches long.

Walton Co, Box 5, Elmwood Branch, Hartford 10, Conn

MORE DATA? Circle 104, inside back cover

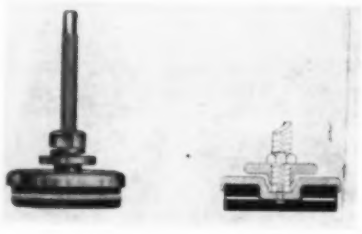
Hand Cutting Torches Designed For Propane and Natural Gas

Airco 2000 Series has an ease-on cutting oxygen valve that allows smooth and gradual oxygen flow. This is particularly helpful in hole piercing, rivet washing and stay bolt cutting.

Torch head is a machined silicon bronze forging; brass gas tubes are in triangular arrangement for rigidity and strength. Mixer housing is a machined brass forging which is fed by two short tubes, one for fuel gas, the other for preheat oxygen. Rear end is a brass forging and the inlet connections will take ¼, 5/16, or ⅜-in. hose.

Air Reduction Sales Co, 150 E 42nd St, New York 17, NY

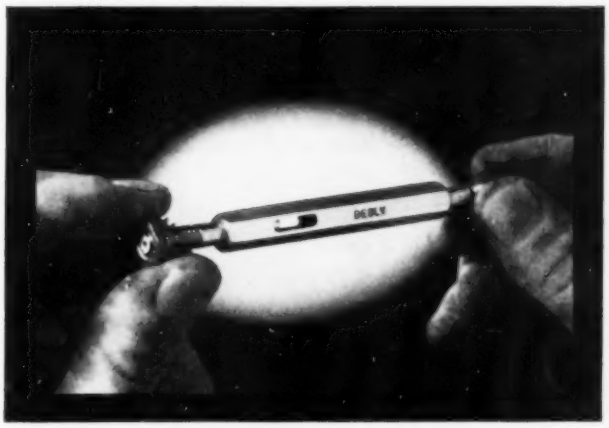
MORE DATA? Circle 105, inside back cover



Light-Duty Machinery Mount Offered in New Series

Unisorb Level-Rite 200 Series for light and medium-duty machinery is designed for individual loadings up to 200 psi. It consists of a Type H

New Besly CP-75 precision gages last 3-5 times longer



Now you can have Besly Precision Gages in *extra hard* chrome plate. Made to tolerances according to U. S. Bureau of Standards specifications, Besly CP-75 precision gages last from three to five times longer than ordinary steel gages. They give you more piece parts per gage, less downtime for gage inspections, lower gage inventory, and will not chip or peel. See your distributor, or *write us today for catalog giving complete information on our full line and prompt service.*

BESLY®

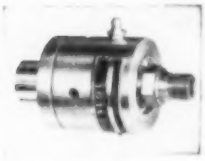
BESLY-WELLES CORPORATION

120 Dearborn Ave. South Beloit, Illinois

Grinders and Abrasives • Taps • X-Press Taps® • Drills • Reamers • End Mills • Tool Bits
Gages • Carbide Tipped Tools, Blanks, Lapped Toss-away Inserts and Holders

Gun Drilling Lets You DRILL PRECISION HOLES *Faster! Cheaper!*

Sealol coolant supply accessories help you get maximum results from any gun drilling operation.



TYPE EL FLUID TRANSFER

Cycling pressures to 1,000 psi and speeds to 10,000 rpm.

Attaches to outboard end of hollow-spindle equipment to transfer coolant to the rotating gun drill.

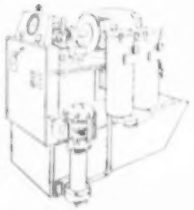
TYPE DH DRILL ADAPTER

Pressures to 1,000 psi and speeds to 10,000 rpm.

Adapts solid spindle equipment to accept rotating gun drills. The coolant transfer is integral with the adapter spindle.

HI-PRESSURE COOLANT SUPPLY UNIT

For all types of precision gun drilling. Pumps, cools, filters coolants at pressures to 1,000 psi—to 40 gpm (higher capacities available).



SEND COUPON TODAY!

SEALOL

SEALOL CORP.
204 Post Road, Providence 5, R. I.

Please send free bulletins covering Sealol gun drilling accessories.

NAME

TITLE

COMPANY

ADDRESS

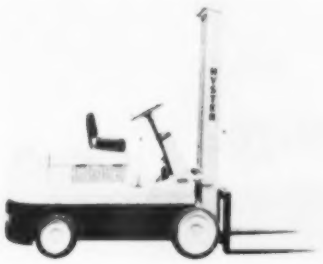
NEW SHOP EQUIPMENT

Unisorb vibration control pad held in an all steel housing which supports a levelling post and lug. Machines are quickly installed and levelled by inserting the levelling post under a leg or bearing point, rotating the screw post from top or bottom, and securing a locking nut. Screw post is free floating to compensate for uneven or pitched floors.

Pad reportedly absorbs up to 85% of transmitted vibration. Mount is available in sets of four or six as original equipment or for installation on existing machines.

Felters Co, Unisorb Division, 210 South St, Boston 11, Mass

MORE DATA? Circle 106, inside back cover



10,000-lb-Capacity Truck Added To Hyster Cushion Tire Line

SpaceSaver 100, 10,000 lbs capacity at 24-in. load center, has an 83-hp Continental engine, 244 cu-in. displacement, that develops 192 lb-ft of torque at 1200 rpm.

Unit is available with standard two-speed, constant mesh transmission or optional power shift Hystamatic transmission. Other options include free-lift uprights and extra wide apron.

Hyster Co, 1003 Myers St, Danville, Ill

MORE DATA? Circle 107, inside back cover

Moog Servovalve Offered For Industrial Applications

New flow control servovalve is designed specifically for application in industrial hydraulic control systems. Series 71 features the Moog two-stage, force balance feedback principle with a large, field-replaceable filter integral within a cast Meehanite body. It can be supplied with either a standard connector or terminal box to accommodate the electrical input.

Valves are available in four sizes: 1, 2.5, 5, and 10-gpm with 1000-psi valve drop and 20-ma input. System pressures from 500 to 4500 psi may be used.

Moog Valve Co, East Aurora, NY

MORE DATA? Circle 108, inside back cover

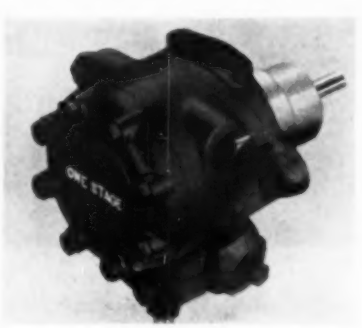
Patterned Flat-Rolled Steel Available in 48-in. Widths

Sheet steel that can be given a variety of rolled-in patterns—including one which has the appearance of fine-grain leather—is now available in widths up to 48 in.

The pattern sheet can be supplied in a variety of gauges and widths, either as cut lengths or coils. It is especially adaptable to the automotive, appliance, and building industries.

Pittsburgh Steel Co, Grant Bldg, Pittsburgh 30, Penna

MORE DATA? Circle 109, inside back cover



Gear-Type Pumps Handle Oil At 20-300 psi and 1200-1800 rpm

New line of gear-type pumps handles lubricating or hydraulic oils at pressures from 20 to 300 psi and speeds of 1200 to 1800 rpm. Capacity of the pumps in the Q7 series ranges from 38 to 41 gallons per hour at 1200 rpm, and from 57 to 62 gallons per hour at 1800 rpm.

The four pressure ranges are 20-40 psi, 40-80 psi, 80-150 psi, and 150-300 psi.

Sundstrand Hydraulic Div, Sundstrand Machine Tool Co, 2210 Harison Ave, Rockford, Ill

MORE DATA? Circle 110, inside back cover

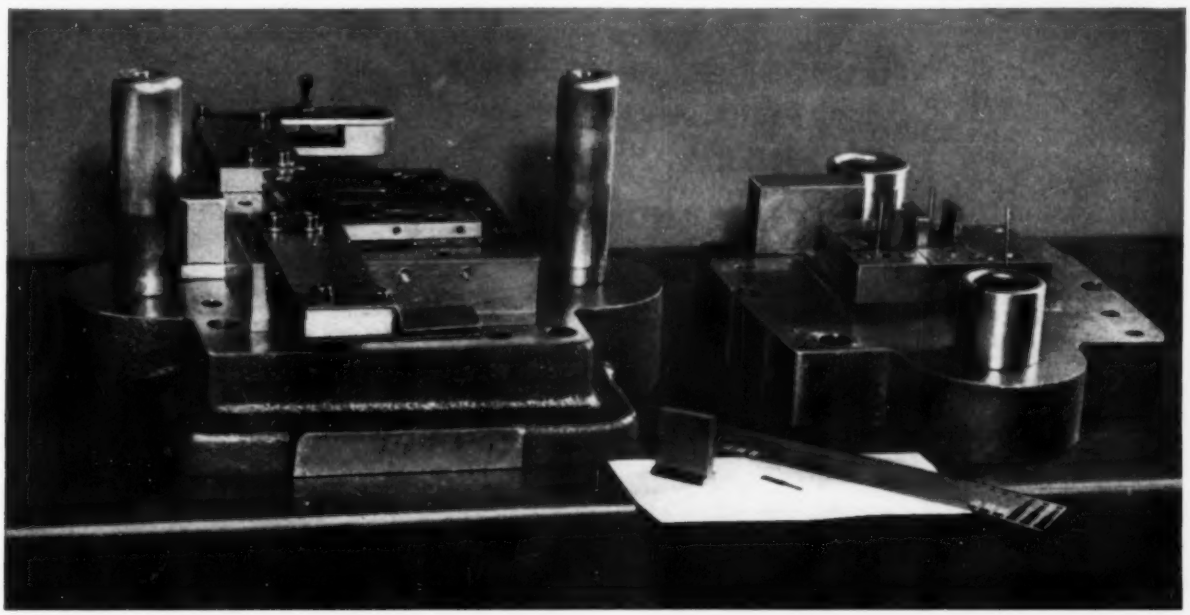
Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



Blanking Die Output Doubles When Bearcat Takes Over

At the Remington Rand Division of Sperry Rand Corp. they were getting up to 50,000 pieces from a set of dies that blanks and forms grooved pins from .025-in. steel strip. Our local tool steel distributor, Leed Steel Co., suggested a change to our Bearcat tool steel. Result? The output increased to about 100,000 before the die needed reworking.

Bearcat has exceptional resistance to wear and shock. Because of its air-hardening characteristic, Bearcat minimizes quenching hazards and distortion in heat-treatment.

WIDE RANGE OF APPLICATIONS

In addition to blanking and forming jobs, Bearcat can be used economically in such varied applications as shear blades, punches, rivet sets, hot headers, die-casting die inserts, and master hobs. In fact, wherever the job calls for a grade having unusual toughness, Bearcat is the answer.

Your Bethlehem tool steel distributor carries Bearcat in stock in a wide size range. He's ready to serve you at a moment's notice. Give him a call today.

←Memo to Die-Casters:

USE CROMO-HIGH V (H-13)

You can't go wrong when you choose Bethlehem Cromo-High V (AISI-SAE H-13) for die-casting. This 5 pct chrome-moly grade, with 1 pct vanadium, has good resistance to wash and erosion, plus plenty of toughness. It's uniformly annealed, for easy machinability. It also has good center density and grain refinement, and is free from porosity.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Periodic Regrinding Improves Tool Life

The service life of many types of tools can be improved if the tools are periodically reground at intervals before they have deteriorated to a degree which impairs their function.

This practice is particularly useful when applied to tools which repeatedly fail in service by fatigue, chipping, spalling, or cracking through heat checks. The objective of preventative grinding is the removal of service-damaged metal before the damage progresses to a depth which would not be removed in normal redressing operations. It is an application of the old proverb, "A stitch in time saves nine," and is just as appropriate when applied to tools as to a small rip in a piece of wearing apparel.

The point at which regrinding should be done during the service of a given tool must be developed by experimental work. It is most practical if it can be made to coincide with a normal shutdown of an operation for other reasons.

CIRCLE 295 READER SERVICE CARD

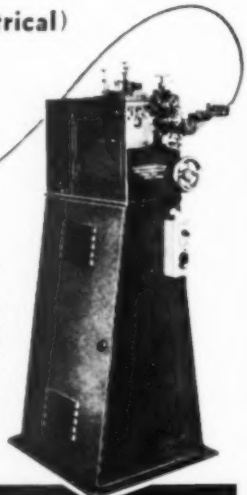
THE MOST COMPLETE LINE OF SPRING MAKING MACHINERY . . .

DESIGNED AND BUILT FOR THE METAL WORKING INDUSTRY

Sleeper & Hartley produce a complete line of spring-making machinery serving the basic metal working industries:

- Fabricated Metal Products
- Instruments
- Ordnance
- Furniture and Fixtures
- Transportation Equipment
- Electrical Machinery
- Machinery (except electrical)
- Miscellaneous Products

Quality and dependable service during 47 years of Sleeper & Hartley production have given the customer satisfaction for which we constantly strive.

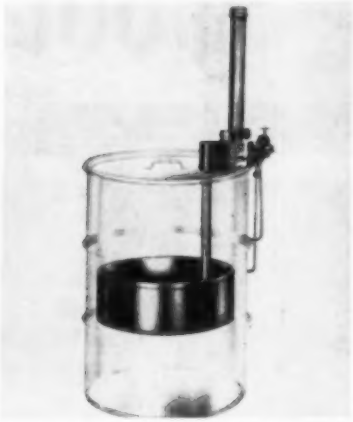


No. 0 UNIVERSAL SPRING COILER, ESCAPEMENT TYPE. Series 720 — 73" Model.

This newest, versatile machine in the exclusive SGH escapement line incorporates the most advanced design engineering in the field, to give greater wire feed range and high speed production. Its many features include extremely accurate wire feed and controls for fine precision adjustment. Inertia is minimized since the only thing that starts and stops with this type feed mechanism is the wire itself.

Write for latest information . . .

SLEEPER & HARTLEY, INC., BOX 1249, WORCESTER 1, MASS., U.S.A.



Device Converts Drums or Tanks To Agitating Parts Cleaning Units

Magnus Porto-Lif can be attached to a 55 or 30-gal open-head drum or soak tank converting it to an air-powered, mechanical agitated parts washer. Device, which can be installed in minutes with simple tools, operates on air pressure of from 30 to 90 psi. Seventy-five pounds of parts can be cleaned at one time.

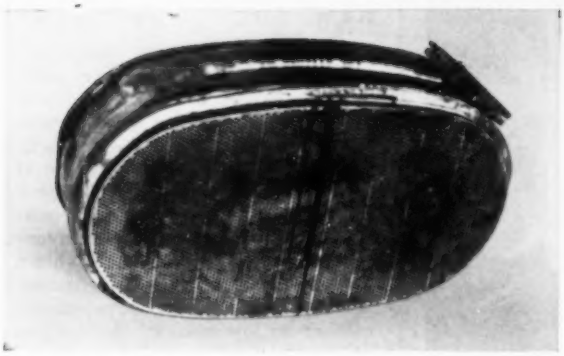
Single lever controls the complete cleaning operation: lowers that platform of parts into the solution, agitates them 140 up-and-down motions per minute, then raises the work to waist-high level for unloading.

Magnus Chemical Co, Equipment Div, Dept AM, Garwood, NJ

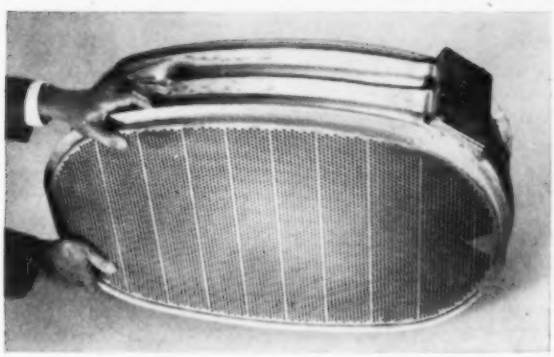
MORE DATA? Circle 111, inside back cover

MOBILE WELDER, designed for general purpose spot welding of parts, is mounted on a lightweight steel cart for ease in moving the unit from one weld position to another. Cart carries welding transformer, heat regulator, electronic controls, air controls, air valve and flexible cables with air operated gun—*Federal Machine and Welder Co, Warren, Ohio*

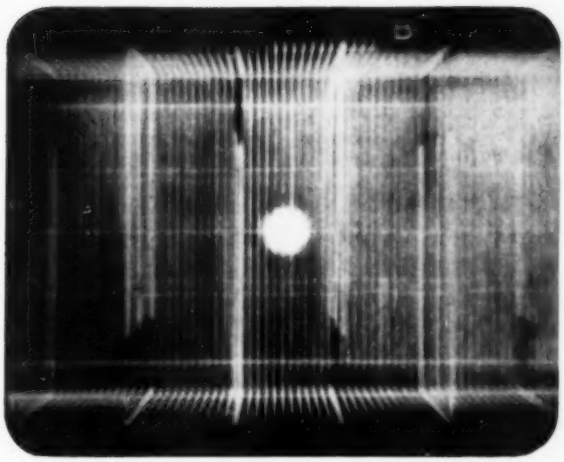
MORE DATA? Circle 112, inside back cover

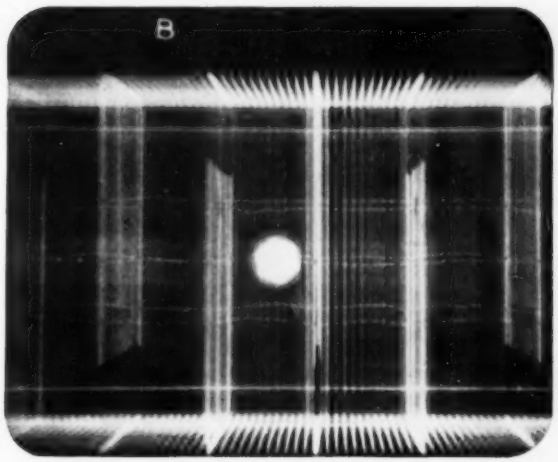


An oil cooler as it comes from the airplane engine. Radiograph below shows accumulations of sludge and dirt on the tubes.



After cleaning, the oil cooler is ready to return to its job. Radiograph below shows dirt gone and passages unrestricted.





To keep an engine's bloodstream clean

OIL COOLERS are vital to today's aircraft engines. At overhaul time they must go back on the engine clean as new. No minute particles of carbon or metal can remain to be a threat to the renewed engine. Cleaning them has become a specialty with SMS Instrument and Accessories Corp. of Idlewild Airport, N. Y. C.

To show that each cooler they clean is free of debris, it is sent to Industrial X-ray Incorporated, New Hyde Park, New York, to be radiographed. And when the cooler goes back to its job, its x-ray certificate of cleanliness goes with it.

In such inspections of assemblies, in quality control, in nondestructive testing, radiography provides a means of "seeing" internal conditions and also a lasting record of what is seen.

Producers of castings, and makers of welded products, find radiography a means of expanding their business and making sure only high-quality work is delivered.

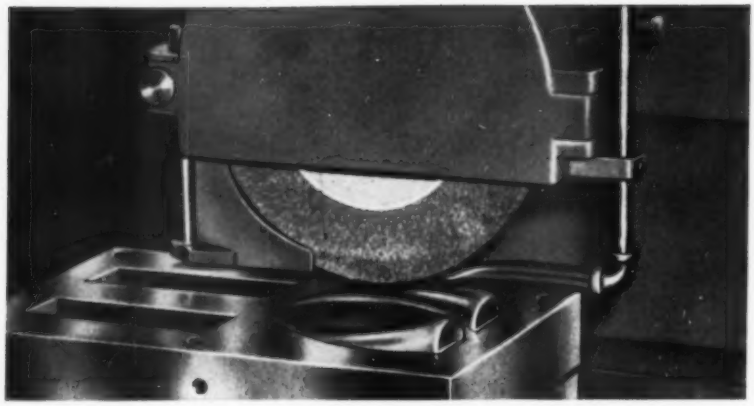
Would you like to learn how it could help you? Contact your Kodak x-ray dealer or the Kodak Technical Representative to talk it over.

X-ray Division . . . EASTMAN KODAK COMPANY . . . Rochester 4, N. Y.

Read what Kodak Industrial X-ray Film, Type AA, does for you:

- Speeds up radiographic examinations.
- Gives high subject contrast, increased detail and easy readability at all energy ranges.
- Provides excellent uniformity.
- Reduces the possibility of pressure desensitization under shop conditions.

Kodak
TRADEMARK

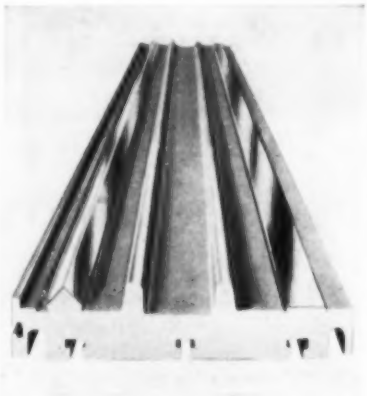


Micro-precision extended for years
ON EVERY COVEL TOOL-ROOM SURFACE GRINDER

Grinding plastic mold dies like this calls for MICRO-PRECISION . . . and the 14" x 24" Covel "60" has it! Also accurately grinds trim, forming, blanking and die-casting dies in addition to jigs, fixtures, dovetail and flat form tools. Ideal for high speed or carbide production parts grinding, too. Covel precision grinders save you money because they give new-machine performance longer—stay "front-and-center" in your tool-room grinder lineup for years and years of MICRO-PRECISION performance. That's because Covel-pioneered features preserve new-machine accuracy longer—for example, hard chrome table ways maintain built-in accuracy far beyond the life of ordinary ways. Before you buy your next surface grinder, it will pay you to learn all the facts about this and other Covel advances.

First with hard chrome table ways

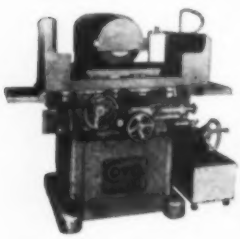
A special plating process developed by Covel applies a hard chrome surface to hand-scraped Vee and flat table ways insuring long-lived accuracy. Many Covel chrome plated ways have been in service for ten years and more without noticeable wear and without a sign of flaking.



Why Covel outperforms other tool-room surface grinders

Hydraulic rapid traverse with 15" cross feed, power elevation and high speed make the Covel "60" able to outperform machines costing much more. Elevating hand wheel is *below* table level and all controls are grouped for easy operation. Optional hydraulic wheel truing device automatically provides a truer grinding surface. *Write for catalog today.*

Micro-Precision a Covel Tradition-Since 1874



Send today for your copy of "The Covel Precision Story" and complete data on the Covel Surface Grinder that meets your needs — seven sizes from 6" x 12" to 16" x 36". Ask for Bulletin AM-79

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

NEW SHOP EQUIPMENT

Precision limit switches incorporate a movable contact assembly using two compressed coil springs to provide a quick make and break action. Leaf spring, carrying the contacts, assures adequate contact pressure at all times, eliminates points of zero contact pressure and provides a non-teasing action even with an extremely slow operating motion. Contact carrier spring affords sufficient contact wipe to assure good electrical contact on low voltage. Switch has an electrical rating of 600 v.

Cutler-Hammer Inc, 205 N 12th St, Milwaukee 1, Wis

MORE DATA? Circle 113, inside back cover

Blind rivets, called Imex rivets, are air and water tight at pressures as high as 500 psi and also highly resistant to vibration. Available with both long and short break mandrels, the rivet can be set with the standard tool used for Pop rivets. Imex rivets are made of aluminum in 0.125 and 0.187 in. diameters.

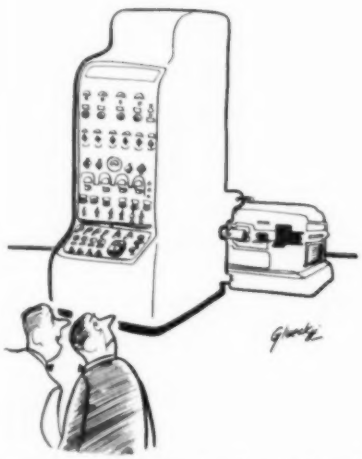
Pop Rivet Div, United Shoe Machinery Corp, West Medway, Mass

MORE DATA? Circle 114, inside back cover

Electric spray gun is a self-contained compressorless unit designed for spraying paints and other liquids, of high and low viscosity. Body is cast aluminum; handle and 28-oz reservoir are of plastic. Operates on 110 v ac with 80 w power rating. Cost is $69.50.

Klepp Bros, Inc, Box 951, White Plains, NY

MORE DATA? Circle 115, inside back cover



"You just pay full price for the controls and we'll throw in the machine—"

The pitman connection of the new Oliver-Farquhar O. B. I. Mechanical Gap Press provides two basic advantages... easy slide and die adjustment and extra strength.

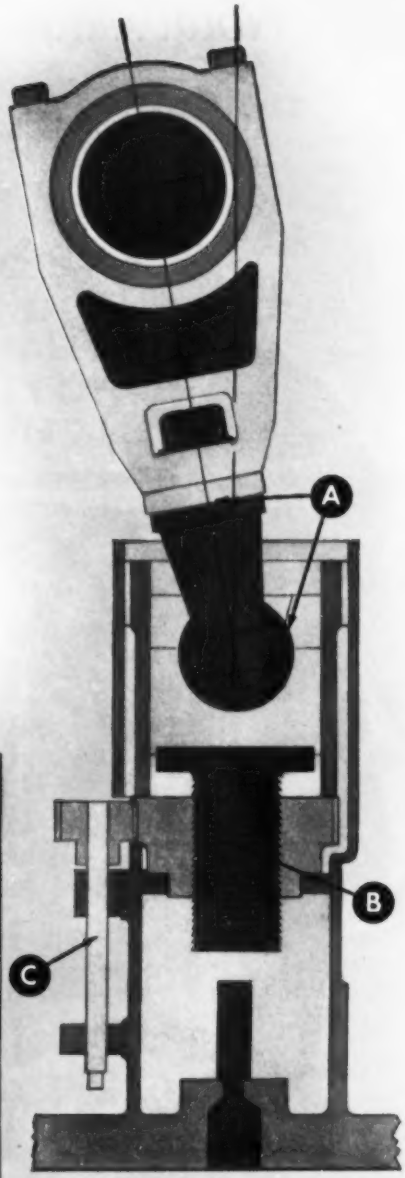
This Oliver-Farquhar Press has

STRENGTH

where you need it...

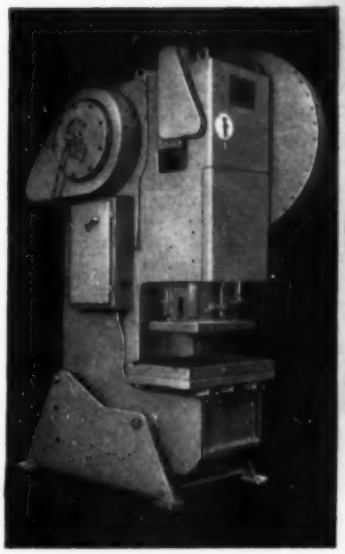
Easy slide adjustment

where you want it...



Oliver-Farquhar design . . . (A) Critical areas are thoroughly supported for maximum strength. (B) Fully guided adjusting screw is held firmly in base. (C) Easy, floor-level adjustment.

The Oliver-Farquhar O. B. I. Mechanical Gap Press has a heavy-duty barrel type pitman connection with the slide adjusting screw fully guided to eliminate side thrust and bending loads on the screw. It withstands the full loads of the press at each stroke and the shocks developed in pressing and stripping. There is no danger of bent screws and cracked or broken pitmans. For faster, easier floor level slide adjustment, a simple, directly connected shaft extends to lower end of slide. No special wrench is required for this manual adjustment.



Oliver-Farquhar O. B. I. Mechanical Gap Presses have many features—in addition to the strong pitman connection—that guarantee years of dependable, efficient service. They are available now for delivery in four standard models: 75, 110, 150 and 200-ton capacities.

Write, wire or phone for complete details or ask for our recommendation.

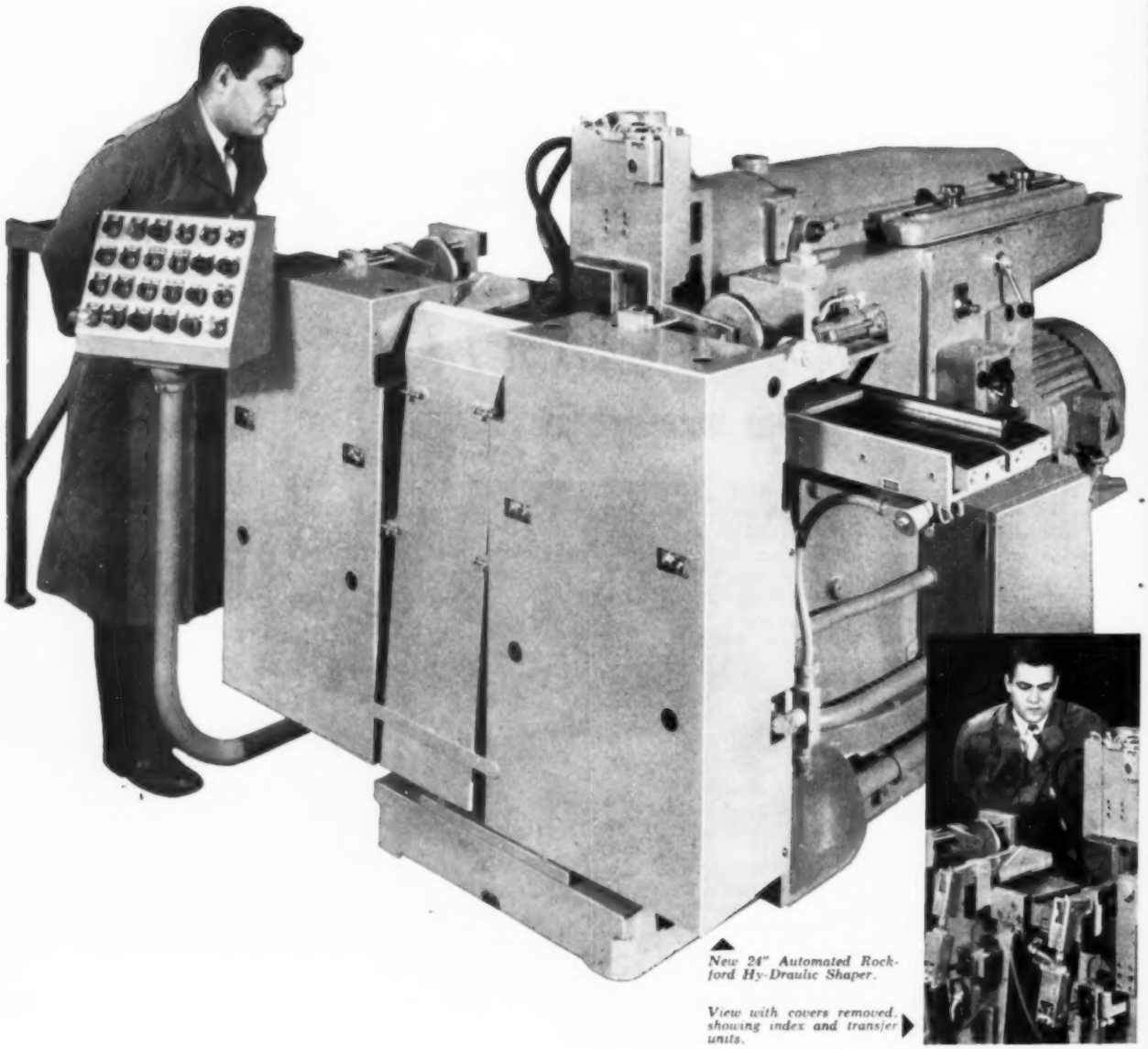
OLIVER *Farquhar* PRESSES

THE OLIVER CORPORATION

A. B. FARQUHAR DIVISION • *Press and Special Machinery Departments* • YORK 15, PA.

CIRCLE 299 READER SERVICE CARD

Now... automation comes to shaping!

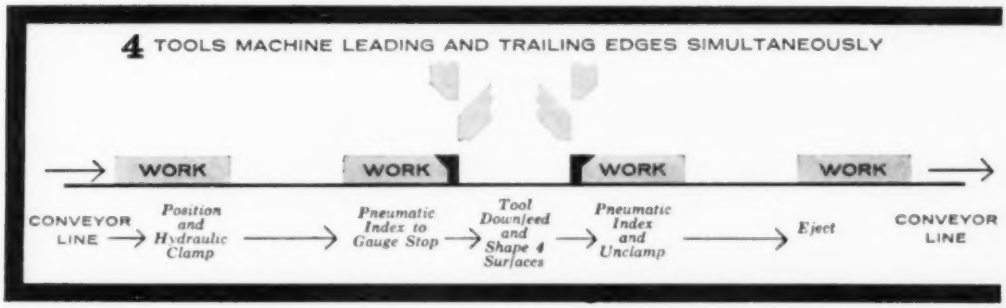


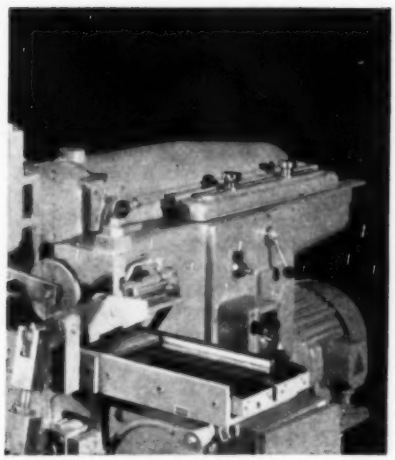
New 24" Automated Rockford Hy-Draulic Shaper.

View with covers removed, showing index and transfer units.

COMPLETE AUTOMATIC CYCLING ON ROCKFORD

HY-DRAULIC SHAPER PRODUCES CONTINUOUS FLOW OF PARTS FOR CONVEYOR-LINE PRODUCTION . . .





Believed to be the first automatic shaper built, this standard 24" shaper with special tool head and cross-rail has been adapted to conveyor-line operation by arranging completely automatic cycling, including loading and unloading.

With this new method, many types of flat plates may be machined accurately and efficiently at high production rates, saving costly cutting tools and extra fixturing expense.

Four standard high speed steel tool bits with identical grinds are used to finish one vertical and one angular surface of each of 2 pieces simultaneously, as shown in diagramatic sketch of the automatic cycle. The machine features pneumatic index, hydraulic positioning and clamping, and positive mechanical feed. Operation is continuous until machine is stopped by operator, or automatic safety devices reject the cycle sequence.

This type of automatic machining has many variations, using Rockford Hy-Draulic Shapers. If you have high output requirements for work which lends itself to this type of machining, send us blueprints for estimates and recommendations.

h HYDRAULIC

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

There's more than luck to

CLOVER COATED ABRASIVES . . .

The man who has used Clover Abrasives for years is apt to believe in luck. *He is lucky* that he has been introduced to Clover products. But that kind of good fortune is built in when the product is made. Part of it rests in our discriminating choice of the best materials available; the other part in the care real craftsmen use in making a tool.

Fifty-odd years of experience have proven many times that Clover Coated Abrasives are a lucky choice because they are made for hard service. Ask your Clover Distributor for samples or for a new Clover Catalog, or write us direct. You owe it to yourself to see the Clover line.

Clover Manufacturing Company

Norwalk, Connecticut

Victor 7-4515

Since 1903

Makers of the famous

CLOVER Grinding and Lapping **COMPOUNDS**

CIRCLE 302 READER SERVICE CARD

IDEAL GOLD BAND

LIVE CENTERS

GUARANTEED TO MATCH OR EXCEED, "CRITICAL" JOB SPECIFICATIONS

In the GOLD BAND line Ideal has combined the latest production methods with their traditionally fine craftsmanship to bring you an unequalled standard of excellence in live centers. Accurate, (to ± .0001") GOLD BAND Live Centers offer "custom" quality at production prices. Specify GOLD BAND Live Centers and your every need can be accommodated from stock . . . 99 times out of 100. Ideal's GOLD BAND Live Centers offer savings, simplified operations and higher lathe output both in quantity and quality. Contact your distributor today . . . or

Send for

Complete catalog data and specifications.

PRECISION FITTED BEARINGS

Ideal Live Centers feature precision machined and hardened ball and/or roller bearings for superior accuracy and performance. Sealed to keep dirt out, grease in.

A COMPLETE LINE FOR EVERY NEED . . . SPECIALS, TOO!

IDEAL INDUSTRIES, Inc.

1057-D Park Ave., Sycamore, Ill.

DISTRIBUTED BY THE NATION'S LEADING INDUSTRIAL DISTRIBUTORS

NEW SHOP EQUIPMENT

All-metal shaft seal, Met-L-Seal, functions at temperatures from –65 to +850 F. All components, except seal face, are made of high-temp alloy steels; face materials are of carbon graphite or various exotic alloys. Hydraulic balance produces optimum sealing under both static and dynamic conditions. Unit reportedly functions at temperatures, pressures, and speeds in excess of capabilities of currently used organic materials yet it fits into minimum space required by aircraft-missile applications.

Gits Bros Mfg Co, 1866 S Kilbourn Ave, Chicago 23, Ill

MORE DATA? Circle 116, inside back cover

Hoppe's No. 9 Solvent is now available for cleaning industrial machines and metals. Useful as a rust preventive, product cleans deposits from all parts of machinery.

Frank A Hoppe, Inc, 2314 N 8th St, Philadelphia 33, Penna

MORE DATA? Circle 117, inside back cover

Ratchet repair kits with complete repair parts for ¼, ⅜, and ½-in. drive models contain a wheel-plug, two dogs, a lever, cam, two springs, and a cover plate with two screws.

Proto Tool Co, 2209 S Santa Fe Ave, Los Angeles, Calif

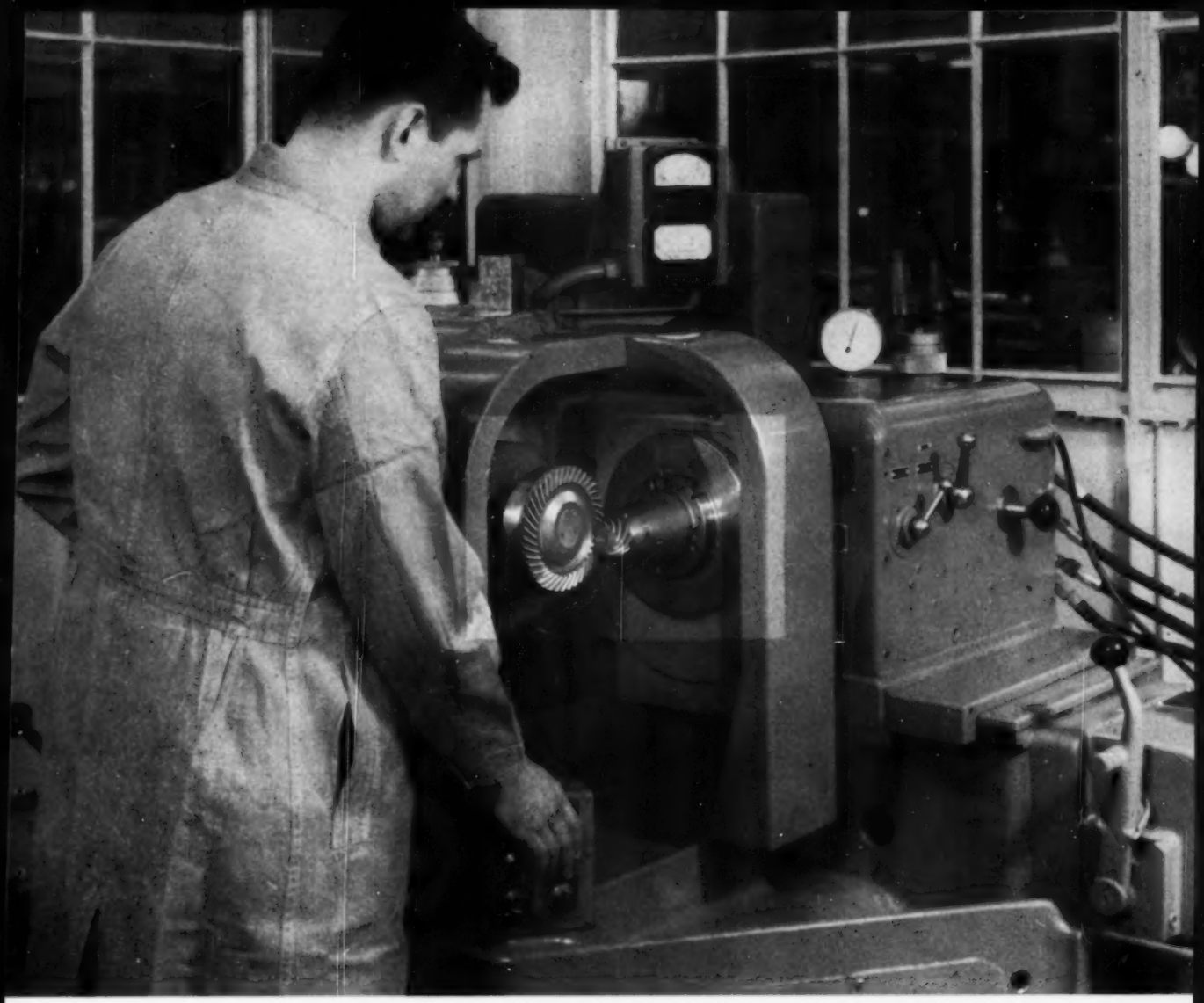
MORE DATA? Circle 118, inside back cover

Flux, designated Wonderflux 4, for any short cycle brazing operation is said to possess extremely low surface tension; begins to melt at 480 F; is water thin at 800 F; is non-corrosive, non-hygroscopic, and does not effervesce when heated.

American Silver Co, 36-07 Prince St, Flushing 54, NY

MORE DATA? Circle 119, inside back cover

"Here's your memo . . . install guards on all machines. . ."



Now you can *speed-test* gears up to 4000 RPM

Since the accuracy of any gear test depends on how well it simulates actual operating conditions, we've developed a hypoid tester with speeds up to 4000 RPM. The higher range of speed on the No. 17A-4000 Hypoid Tester makes possible a new standard in the testing of bevel gears.

Complete testing on one machine. The No. 17A-4000 Hypoid Tester is arranged for both power and slow rolling tests. With the power test you can observe a gear's smoothness of operation, its noise characteristics, and its tooth contact pattern.

Roll test the gear and you get accurate readings of its eccentricity, tooth size, spacing, and profile.

With the No. 17A-4000 Tester you can test any right angle straight bevel, Zerol® bevel, spiral bevel and hypoid gear of any pitch and up to 20" OD.

Pre-set backlash control. The No. 17A-4000 Tester has a new hydraulic backlash control mechanism. The control automatically duplicates your pre-set backlash value when you change the relative positions of a gear pair to simulate actual operation.

Exact duplication of settings. Indicator set-up fixtures are available for large quantity testing. With these gages you can make identical settings on a battery of machines, or get the same setting repeatedly on a single machine.

New bulletin. We've prepared a bulletin on the No. 17A-4000 Hypoid Tester to answer any questions you might have about its construction or operation. Write for a copy.

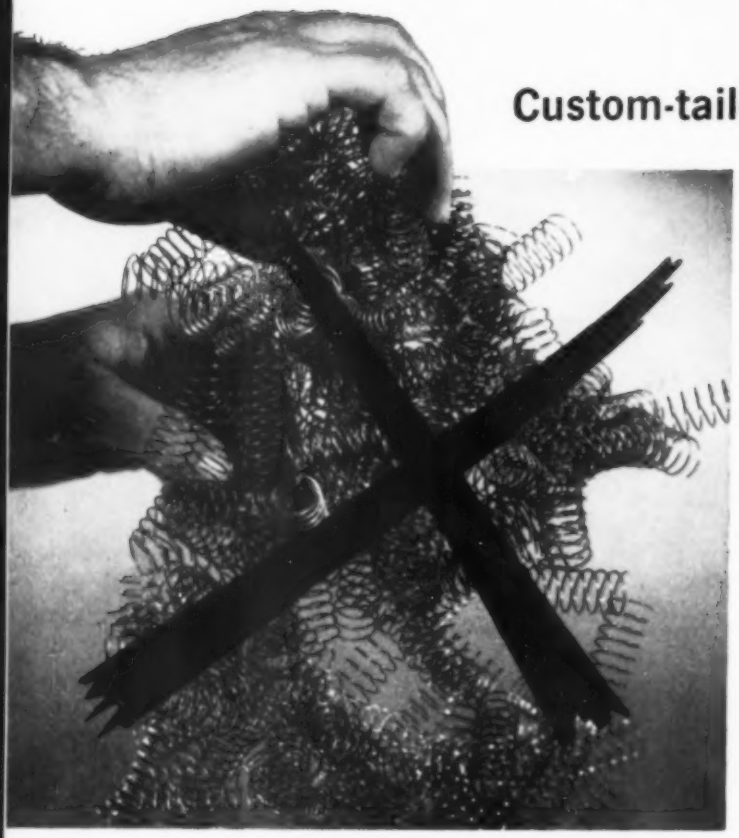
GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

75

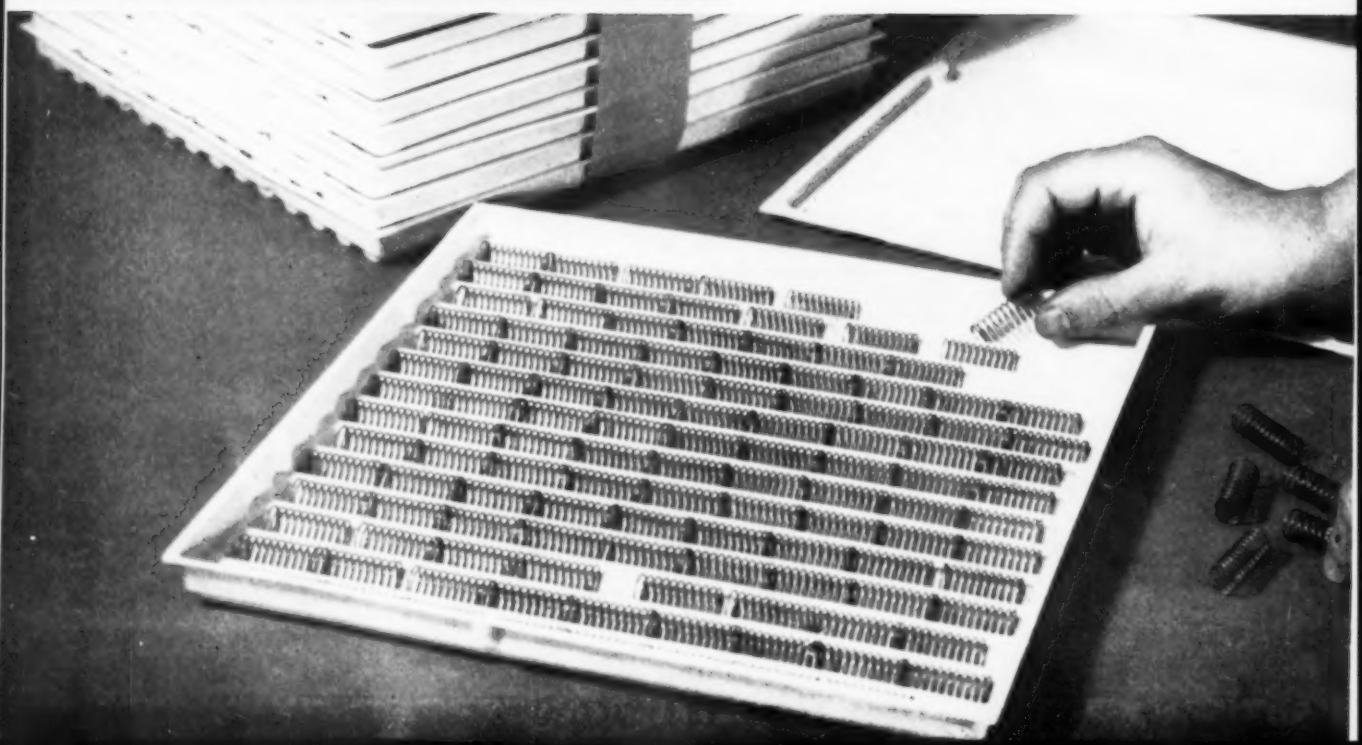
CIRCLE 304 READER SERVICE CARD

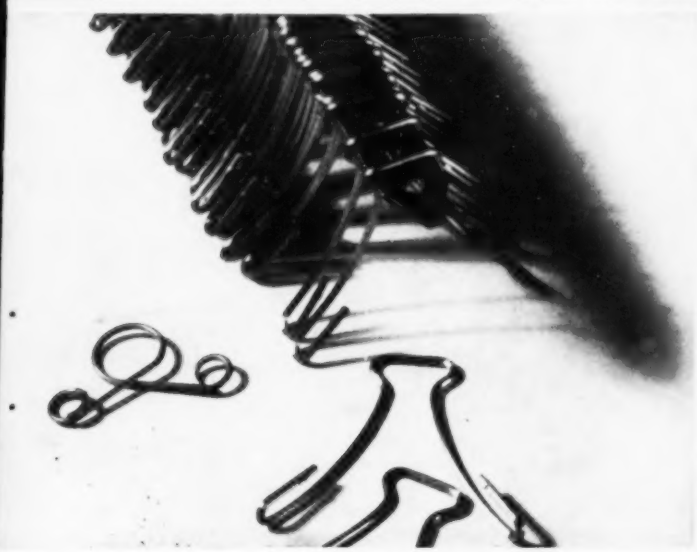
NEW... Spring Flow®

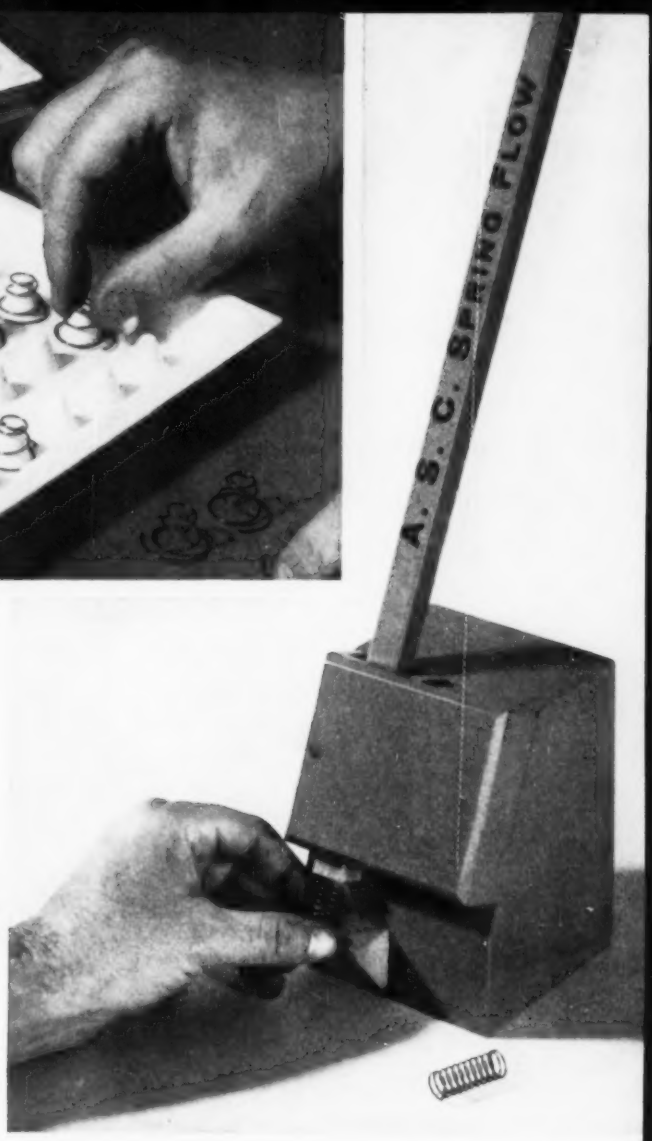


Custom-tailored packaging of springs that cuts costs and speeds operations in your plant

Spring Flow is a systematic approach to the problems of handling and storage of springs, wire forms, small stampings, in customer plants. It overcomes time-wasting tangling, and the distortion that often results from tangling. It can be engineered for specific applications to expedite hand or automatic assembly.







Spring Flow lowers handling and assembly costs — eliminates distortion — protects finish

Spring Flow makes use of a variety of modern materials, dispensers, containers. The extent to which it may be applied depends on the complexity of each individual part and handling requirements. The cost of Spring Flow is frequently offset by resulting savings.

The potential benefits of Spring Flow almost defy imagination. Ask for a Spring Flow proposal for your springs or other fabricated-metal products. Or find out more about this exclusive service by writing for the new booklet—"Spring Flow."

Associated Spring Corporation

General Offices: Bristol, Connecticut

Wallace Barnes Division, Bristol, Conn. and Syracuse, N. Y.
B-G-R Division, Plymouth and Ann Arbor, Mich.
Gibson Division, Chicago 14, Ill.
Milwaukee Division, Milwaukee, Wis.
Raymond Manufacturing Division, Corry, Penna.
Ohio Division, Dayton, Ohio
F. N. Manross and Sons Division, Bristol, Conn.
San Francisco Sales Office, Saratoga, Calif.
Seaboard Pacific Division, Gardena, Calif.
Cleveland Sales Office, Cleveland, Ohio
Dunbar Brothers Division, Bristol, Conn.
Wallace Barnes Steel Division, Bristol, Conn.

Canadian Subsidiary: Wallace Barnes Co., Ltd., Hamilton, Ont. and Montreal, Que. Puerto Rican Subsidiary: Associated Spring of Puerto Rico, Inc., Carolina, P.R.

CIRCLE 306 READER SERVICE CARD

My George was like that...

He used to be unfit to live with until they started having their gears made to order by CINCINNATI GEAR. And now young George is having the same experience at his place. Mary just invited me for a visit—she says their home is such a happy one now.

Guaranteed quality and reliability of product through the years have earned for us a long list of thoroughly satisfied customers. Send prints of your custom gear and gear box requirements for quotation.

CINTI®

THE CINCINNATI GEAR CO.

Wooster Pike and Mariemont Ave. Cincinnati 27, Ohio
Custom Gear Makers Since 1907

GEARS, good gears only

NEW SHOP EQUIPMENT

Paint spray booth lining that saves clean-up time and eliminates strippable lacquer is available. Technique consists of lining booths with Armalon TFE fluoro-carbon coated glass fabric. Fairprene 5140 cement is used as the bonding agent. Paint adheres so loosely to surfaces coated with this chemical substance that thick layers may be removed easily by hand for an indefinite period.

Du Pont Fabrics Div, Du Pont Co, Wilmington 98, Del

MORE DATA? Circle 120, inside back cover

Magnetic tin plate attachment designed for holding loose sheets during transporting on a pallet securely grips the load to prevent slipping or tipping. Magnetic control switch mounted on the truck cowl has a maintained contact position to energize the magnet for securing. Off position of the switch de-energizes the magent for releasing the load and for standard fork truck operations.

Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio

MORE DATA? Circle 121, inside back cover

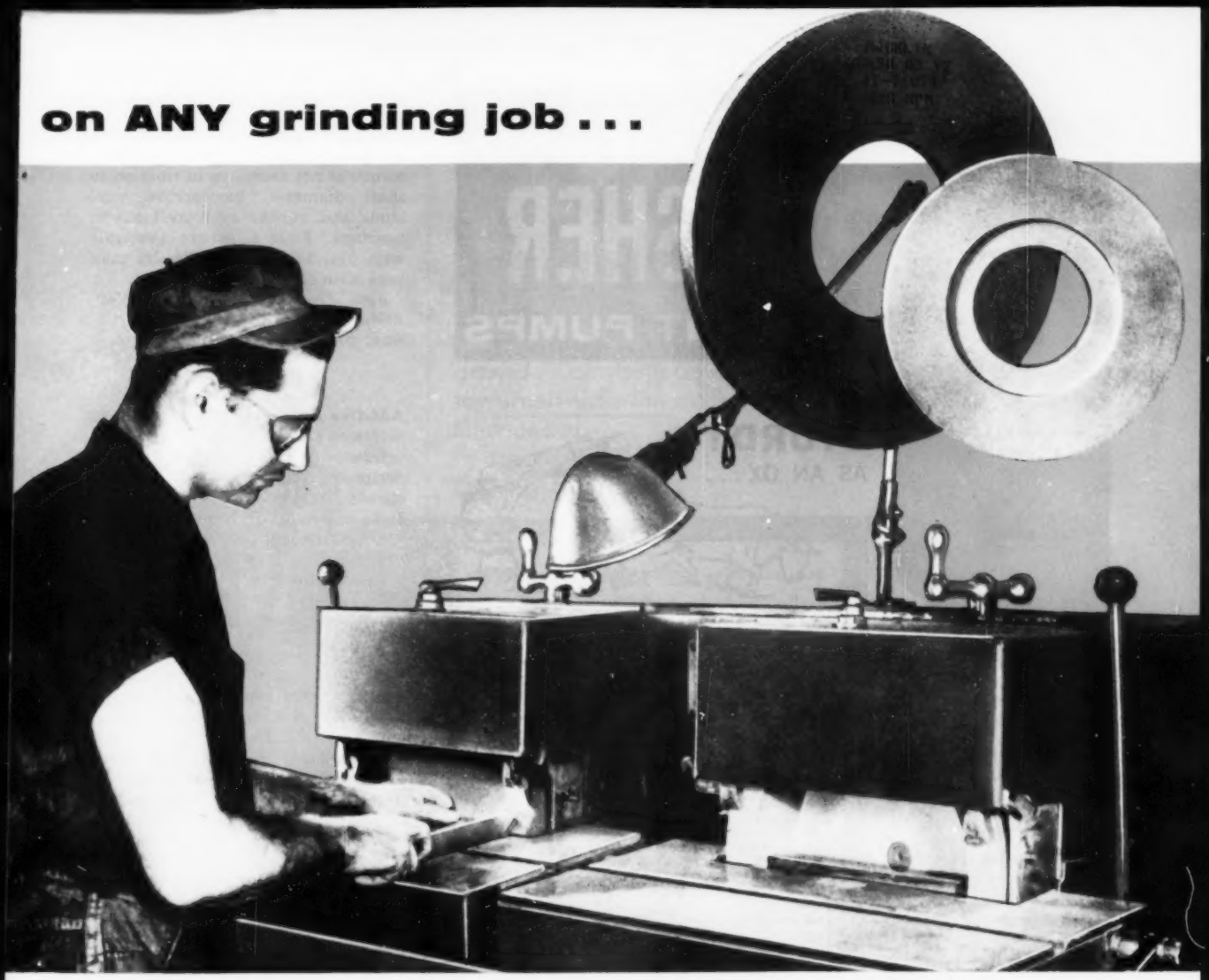
Simplex machine unit bearings, designed for light loads at normal speeds, include a single row bearing of deep-groove design with extended inner ring, equipped with two setscrews for locking the bearing on its shaft. Separable seals may be used either singly or on both sides of bearing. Wire lock ring holds the entire unit securely in its straight bore housing. Bearings are available in shaft sizes from ½ through 1 3/16 in.

Hoover Ball & Bearing Co, 5400 S State Rd, Ann Arbor, Mich

MORE DATA? Circle 122, inside back cover

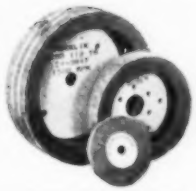
"How is it working otherwise?"

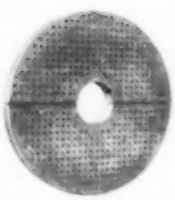
on ANY grinding job . . .



you can protect your production

with MACKLIN *"Wheels of Profit"*





CUSTOM-ENGINEERED FOR YOUR PARTICULAR GRINDING JOB,

Macklin "wheels of profit" for industry, add value to your work . . . increase your production . . . and turn out a better product. There are Macklin wheels of every type and size for your particular grinding job.

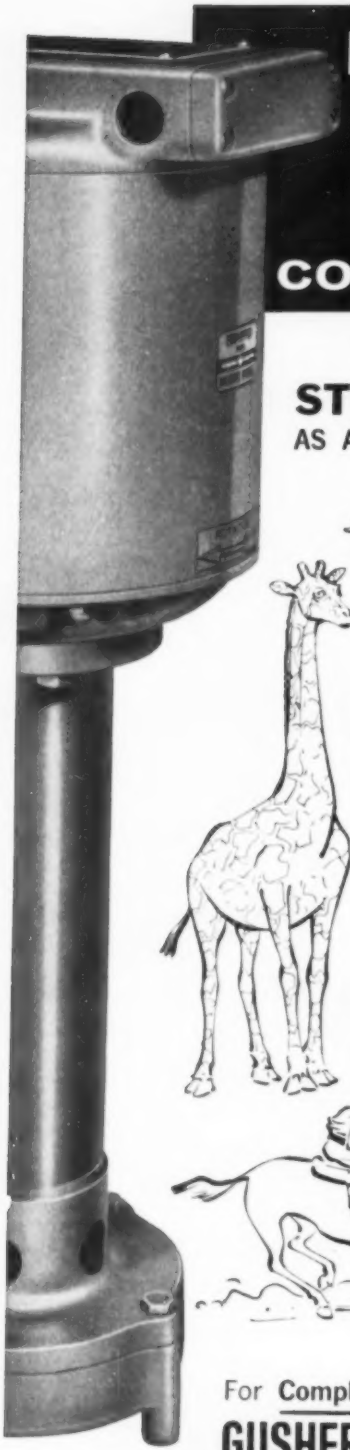
FOR PRACTICAL ANSWERS to your specific grinding problem, consult a Macklin Abrasive Engineer or your local Macklin Distributor. You'll get expert, on-the-job assistance in determining the exact wheel for top production efficiency.

WRITE OR PHONE TODAY FOR COMPLETE INFORMATION

MACKLIN company

Dept. 70 Jackson, Mich.

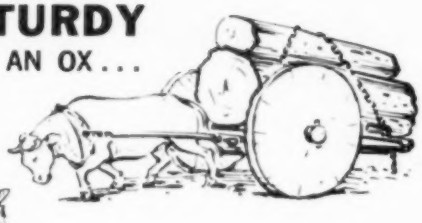
CIRCLE 308 READER SERVICE CARD



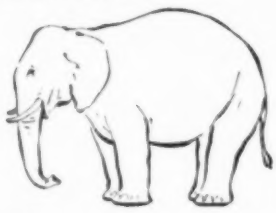
RUTHMAN GUSHER COOLANT PUMPS

are

STURDY
AS AN OX...



LONG LIVED
AS AN ELEPHANT...



SILENT
AS A GIRAFFE...

WELL DESIGNED
AS A THOROBRED

For **Complete** Satisfaction Specify
GUSHER COOLANT PUMPS

THE **Ruthman** MACHINERY CO.
1819 Reading Road, Cincinnati, Ohio

- COOLANT PUMPS
- CIRCULATORS • AGITATORS
- MOLTEN METAL PUMPS

NEW SHOP EQUIPMENT

Flexible couplings, Series 400 for use on direct-driven machinery where torque is not excessive in relation to shaft diameter, incorporate steel studs and rubber cushioned sleeve bearings. Four sizes are available with 1¼, 1¾, 2¼ and 2¾-in. max bore with standard square keys.

Ajax Flexible Coupling Co, Westfield, NY

MORE DATA? Circle 123, inside back cover

Additive for alkaline paint stripping solutions assists in removing difficult synthetic finishes. Designated Oakite Stripper Additive No. 4, solvent speeds removal of paint built-up from hooks, spray booth filters, and other equipment used in the painting operation.

Oakite Products, Inc, 12½ Rector St, New York 6, NY

MORE DATA? Circle 124, inside back cover

Pilot-operated control valves, designated Speed King Hi-Speed Inline, are available for use in the new Andrus-Coon fail-safe, anti-repeat press control system. Featuring split-second response, and paired in tandem to afford positive cutoff of air, standard Speed King Inlines are fitted with external stem extensions which operate limit switches used to provide electro-mechanical monitoring and interlocking of valve action in the fail-safe control system.

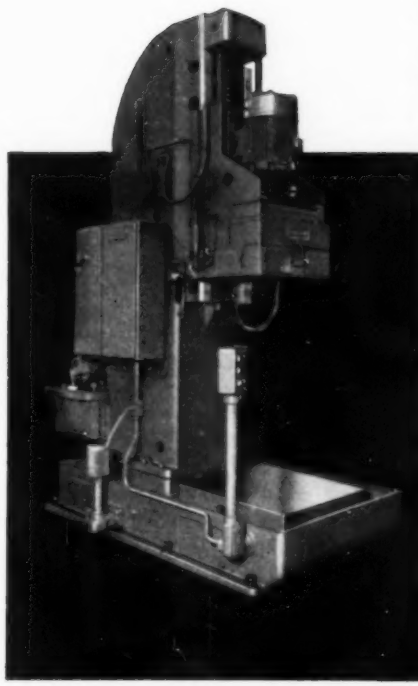
Valvair Corp, 45½ Morgan Ave, Akron 11, Ohio

MORE DATA? Cirle 125, inside back cover

"Of course, that's only a suggestion and you don't have to follow it unless you want to keep your job."

fast changeover!

provides continuous operation
for small-lot runs on
BarnesdriL
hydraulic-feed, way-type
Drilling Machines



This machine arranged with 16-spindle auxiliary head, adjustable-center spindles and slip plates to employ any number of spindles in the pattern desired. Ease of changing production set-ups by substituting new slip plate and fixtures keeps machine operating full time.

Before you buy any drilling equipment, see these new BarnesdriL hydraulic-feed Drilling Machines. Auxiliary multiple-spindle heads, with adjustable centers and slip plates, give you quick changeover to the number of spindles and drill patterns you need to meet production schedules on small runs. No costly set-up or loss of production time is necessary. By taking advantage of this flexibility and quick production changeover which these machines offer, you can maintain continuous production operations with minimum cost per piece on a wide range of work.

50-Spindle Adjustable Center Auxiliary Head with Slip-Spindle Construction.

these features keep maintenance costs low!

Direct Motor Drive Eliminates Linkage
Ample Stroke Clearance for Easy Tool Changes
Hydraulic Cylinder Serviceable without Dismantling Unit
All Valves Flange-Mounted
Hydraulic System is Mannifold-Arranged

Ask for an estimate on processing your short-run drilling operations, using these new BarnesdriL Machines.

BARNES DRILL CO.
830 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 13121 Puritan Avenue

Mill Odd Shapes

...with Barber-Colman Form-Relieved Cutters

We don't expect you to have a job exactly like this . . .

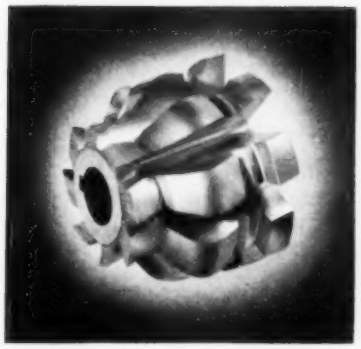
. . . but the manner in which cutter design was established may illustrate important benefits gained by submitting part prints to the Barber-Colman Tooling Service.

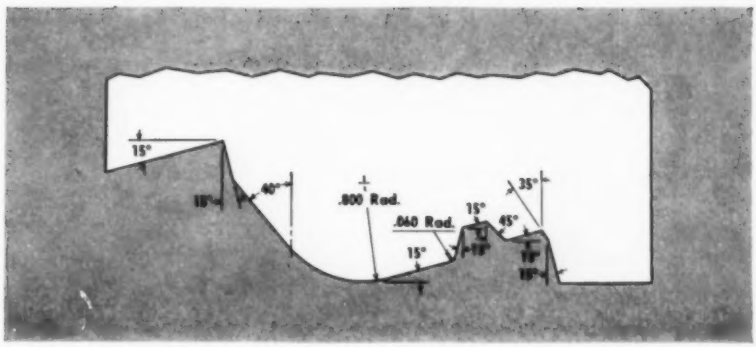
Whether you have irregular forms or a combination of straight surfaces to machine, a comprehensive engineering analysis will help you determine the one best cutter for increasing accuracy and combining operations economically.

Electronic computer aids cutter design

This cutter requires a 10° helix and a 10° positive radial rake to produce the accuracy and smooth finish on the part. The helical flutes and radial rake make it necessary to calculate the cutter tooth form which will produce the desired part form. All plot points, formerly obtained manually, were determined rapidly and accurately on a Bendix computer. Only the points where a change in form

in One Operation





occurs were obtained manually. Over 60 other points were determined quickly by the computer.

An electronic computer has the following advantages for you:

1. *Accurate cutters* — A direct solution is possible through the application of mathematical formulas which eliminate trial-and-error solutions. The great number of plot points which can be determined quickly and accurately assures exact duplication of complex shapes.
2. *Economical design* — You get the highest possible number of engineering man-hours devoted to actual development of the cutter because fewer hours are required to work out details.
3. *Faster service* — Speed of computation permits us to check a number of designs and still meet reasonable delivery schedules.
4. *Flexibility to change* — All variables other than form, such as helix angle, side clearance, number of teeth, cam, diameter, rake, etc., can be changed at any stage of engineering without rigidity at our end. There's no incentive to "save" a design should a different helix angle or diameter be desired.

Design of this cutter included a cutting clearance problem. If the part were set square with the cutter, a two-piece cutter with axial relief in both directions would be required. However, by tipping the part at 15°, a one-piece cutter can be used.

Let us analyze your milling operations

The Barber-Colman Tooling Service is the most complete milling cutter facility available under one roof. Your part drawing can be evaluated in terms of every cutter style, for which we have complete manufacturing facilities: (1) standard or special cutters, or a combination of these in a gang; (2) high-speed steel or carbide-tipped; (3) eccentric-relieved or profile-type; and (4) ground or unground form.

There is a lot of wisdom in rechecking operations periodically in terms of new tooling and methods. This is not a difficult or costly thing to do. Yet it may reveal golden opportunities to tighten up tolerances, improve surface finish, or reduce manufacturing costs. It may be on a time-consuming planer job, a series of flat-surface milling operations, complex form milling, or even new pieceparts.

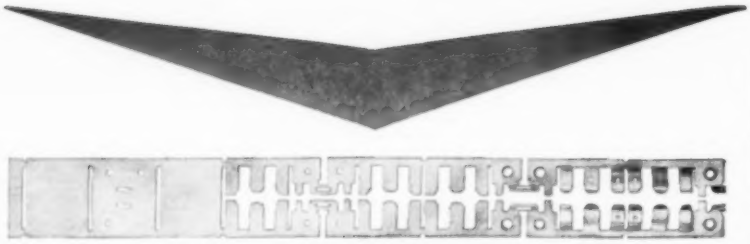
How about putting the Barber-Colman Tooling Service to the test? It will cost nothing to submit part prints or discuss your jobs personally with a Tooling Specialist. We're ready any time you are. Call your nearest Barber-Colman field office or the factory — TR 7-5741.

Barber-Colman Company

BARBER COLMAN

41 Loomis Street, Rockford, Illinois

CIRCLE 312 READER SERVICE CARD



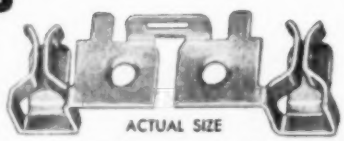
Blanking, Piercing and Preforming in Press

Cutoff

NILSON 4-SLIDE

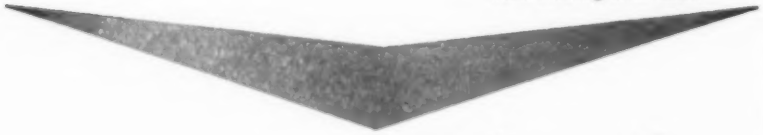
BLANKS *and* FORMS IN ONE CYCLE!

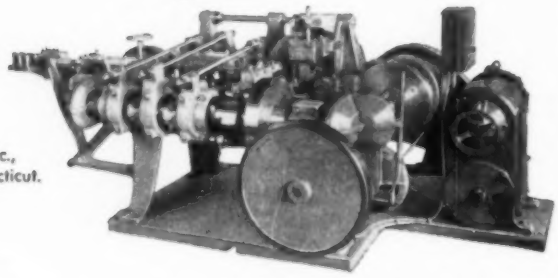
Partial Forming with Slides



ACTUAL SIZE

Final Forming with Slides





MANUFACTURER:
Harvey Hubbell, Inc.,
Bridgeport, Connecticut.

PRODUCT:
Contact Spring.

PRODUCTION:
136 Parts Per Minute.

Nilson 4-Slide Machine with Built-in Press

Harvey Hubbell shifted production of this part from a conventional press and progressive dies to a Nilson 4-Slide with built-in press. The immediate results: elimination of two secondary operations . . . simpler die . . . higher production rate . . . no stripping problems.

Harvey Hubbell also found that vertical mounting of die makes replacement easy . . . permits automatic disposal of scrap by gravity. And maintenance costs are incredibly low—this machine has been operating for twelve years without major repairs!

Nilson builds 7 models of ribbon metal forming machines, with built-in press sections ranging from 5 to 75 tons capacity. One of these machines may help you bring your stamping methods up-to-date!

Write today for the Nilson General Catalog on Automatic 4-Slide Equipment.

NILSON
THE A. H. NILSON MACHINE CO.
601 Bridgeport Avenue • Shelton, Conn.

AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT

FIELD REPORT...

Lahr Sets Up New Division To Make Multi-Unit Machines

Lahr Machine & Tool Corp, Toledo manufacturer of tape-controlled deep hole drilling machines, and air and hydraulic die cushions for all types of power presses, is expanding into the field of production multi-unit machines. New division, Lahr-Tandco, will offer a new concept of a building block, standard multi-operation unit machine for drilling, reaming, boring, and tapping, both in vertical and horizontal types. Division is under the management of John Hoenig, a company vice president. Associated with Lahr in this expansion is Herbert Tigges, former executive vice president of Baker Brothers, Toledo.

$45-Million A-Sub Contract Goes to New York Ship

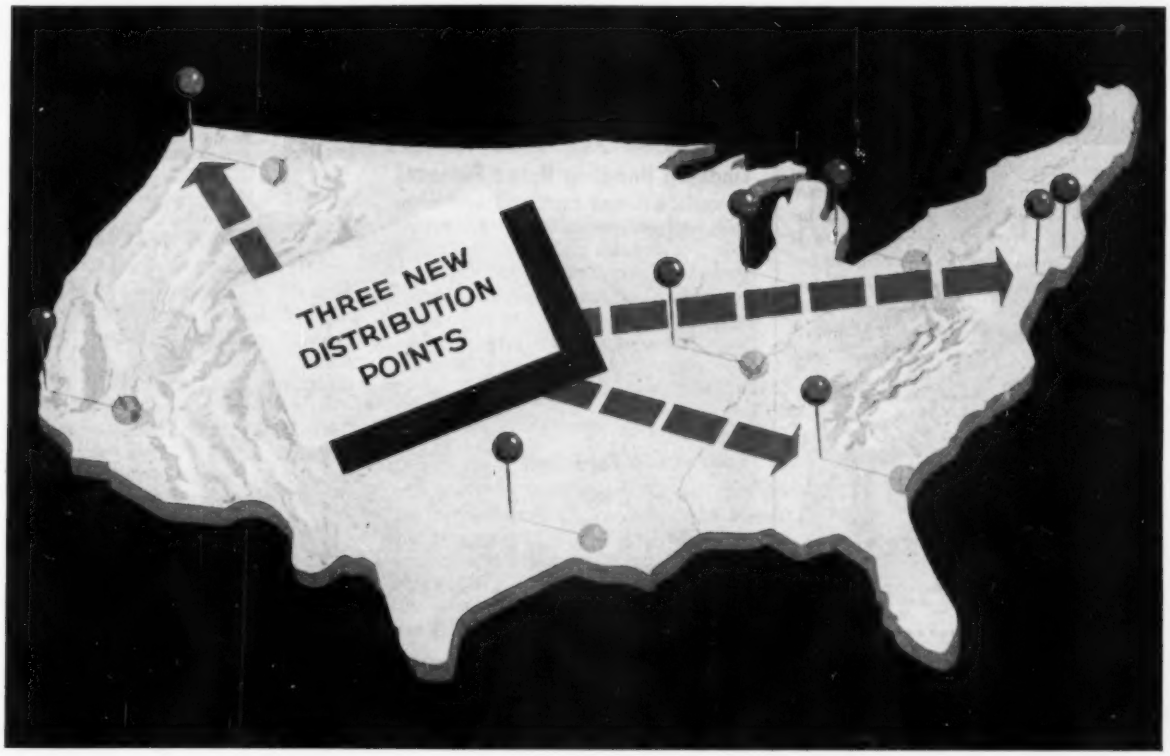
New York Shipbuilding Co's yards in Camden, NJ, have Navy go-ahead on construction of two nuclear-powered subs at a cost of $45.3 million. Engineering will begin at once; actual construction, to start within six months, will give steady work to a force of between 1500 and 2000 for about three years. Camden yard is now building a non-nuclear sub as well as the first nuclear-powered passenger-cargo ship. Employment rose in 1958 to 10,600 from previous year's 5600.

Norge Ups Employment

Norge (home appliance) Division of Borg-Warner Corp has added 700 workers and a second shift at its Muskegon Heights, Mich, refrigerator and home freezer plant. Refrigeration equipment business is spark-

"The men like me—that's okay. But the union likes me too—that's what got me worried."

DOW | MAGNESIUM



DOW ADDS NEW SUPPLIERS

speeds service on magnesium tooling plate

E. F. BAILEY COMPANY
612 Sixth Avenue South, Seattle 24, Washington, MAin 4-5715

CLENDENIN BROS., INC.
4309 Erdman Avenue, Baltimore, Maryland, EAstern 7-4500

HUBBELL METALS INC.
356 Sessions Street, Marietta, Georgia, 7-3718

To meet the growing demands of industry for magnesium tooling plate, Dow has expanded its distribution network. Three new suppliers will help to speed delivery and make it more convenient to buy magnesium tooling plate and square tubing.

Lightweight, low-cost, easy-to-handle magnesium tooling plate cuts machining time, welds easily. Close flatness tolerances and high dimensional stability make surface machining unnecessary for most tooling uses.

Consider magnesium for your tooling needs. Contact the Dow magnesium supplier near you, or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 1335F4-6.

MAGNESIUM TOOLING PLATE IS ALSO AVAILABLE FROM STOCK AT:

COPPER AND BRASS SALES,
CLEVELAND, OHIO

COPPER AND BRASS SALES,
DETROIT, MICHIGAN

FULLERTON STEEL AND WIRE CO.,
CHICAGO, ILLINOIS

HUBBELL METALS INC.,
KANSAS CITY, MISSOURI

HUBBELL METALS INC.,
ST. LOUIS, MISSOURI

A. R. PURDY., INC.,
LYNDHURST, NEW JERSEY

RELIANCE MAGNESIUM CO.,
LOS ANGELES, CALIFORNIA

JOSEPH T. RYERSON & SON, INC.,
DALLAS, TEXAS

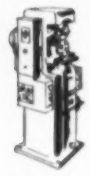
THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

Permanent METAL MARKING

When you specify NOBLEWEST Marking Machines or Marking Tools, you are assured of the finest that the marking industry has to offer. Noblewest marking is *permanent indented marking* . . . good for the life of your product. Illustrated below are the basic types of equipment. Write for catalog. Noble & Westbrook Manufacturing Co., 17 Westbrook Street, East Hartford 8, Conn.

General purpose Roll-Marking Machines

Rapid production Roll-Marking Machines



Precision Graduating Equipment

Mechanical and Pneumatic Marking Presses

Bench Marking Machines

Automatic Numbering Heads

Precision Marking Dies

Hand Marking Tools

A few desirable territories open to qualified representatives.

MARK IT BEST WITH
NOBLEWEST
BETTER MARKING AT LOWER COST

Field Report . . .

ing the entire line; factory sales of refrigerators and home freezers are running three to four times higher than those for the same period last year, according to President Judson S Sayre.

Lindberg Handling Upton Furnaces

Complete line of high and low temp salt bath furnaces for any production, pilot plant, or lab use, available from Lindberg Engineering Co, Chicago, now includes by joint agreement the complete line of Upton salt bath furnaces manufactured by Upton Electric Furnace Co, Roseville, Mich.

Contract to Ford Unit

Aeronutronic Systems, Inc, Los Angeles subsidiary of Ford Motor Co, has a $2.3 million contract from the AF Ballistic Missiles Division for the development and testing of decoys for the ICBM program. Project will be handled by Aeronutronic's Space Technology Div.

Chrysler to Do Initial Work On New M-60 Medium Tank

Army is negotiating with Chrysler Corp to work on initial production of the M-60, the nation's first diesel tank. Pilot production line will be set up at the Newark, Del, plant. After initial work, bidding to do further production will be open to other companies. The tank will be equipped with 105-mm guns that'll be brought over from Britain for use on the first versions of the M-60.

H K Porter Will Build . . .

. . . its 50th plant in Danville, Va. Target date for beginning operations in the new tool-making facility is Sept. Eventual employment will be between 350 and 500.

Dayton Rubber Acquires Aircraft Equipment Makers

Dayton Rubber Co has purchased, for an undisclosed sum, Aircraft Standards, Inc, Santa Monica, Calif, manufacturer and designer of highly-engineered tools, dies, and fixtures for the aircraft and missile industries. Dayton has also taken over Hardman Tool & Engineering Co of Los Angeles, one of the country's largest manufacturers of aircraft seats, in addition to sheet metal and welded tubular aircraft structures.

DuPont Titanium Dioxide Plant . . .

. . . is expected to be in full production within the next month. The $30-million installation at Johnsonville, Tenn, has already made trial runs called highly successful.

$8 Million Contracts to Lockheed

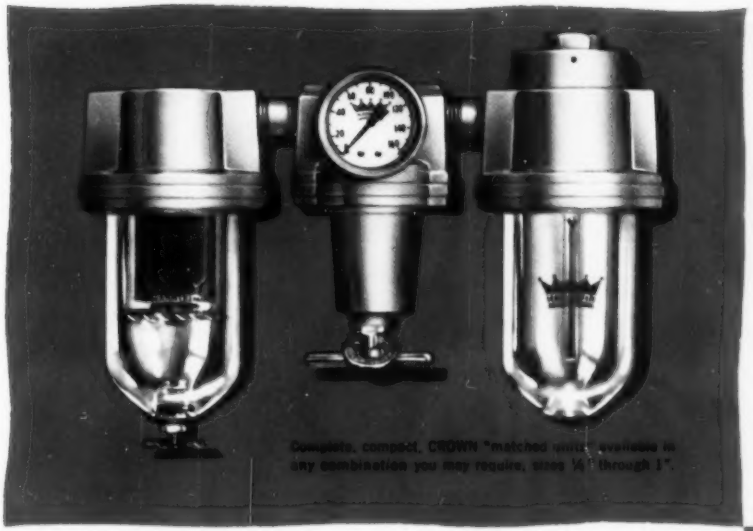
New Navy contracts totaling $8 million have been awarded to Lockheed Aircraft, Burbank, for purchase of a standard commercial propjet Electra and for the development, testing, and modification of the aircraft for use as an anti-sub plane. Called the YP3V-1, it's expected to make its first flight this fall. Two earlier contracts provided approximately $12 million for initial research, development, and pre-production work.

R&D Company Set Up in Canada To Further Uses of Diamond Grit

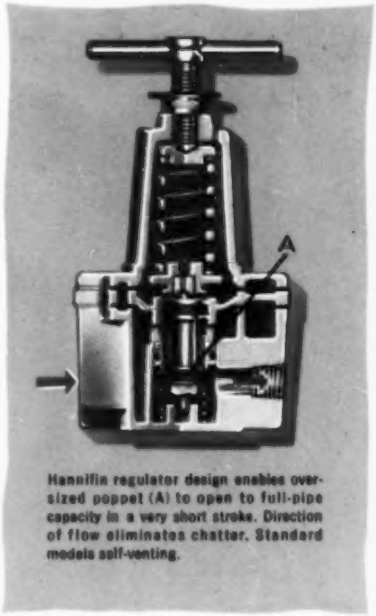
New research company called Consolidated Diamond Development Co, Ltd, has been formed in Canada by Engelhard Industries of Canada, Ltd, and South African diamond interests to investigate further fields for uses of natural diamond grit. Main object will be to expand and develop uses of natural diamond abrasives for wheelmakers and other users of the material to whom the results of experimental work will be made available.

"That's nothing—you should see it after he washes it."

From HANNIFIN *Crown* air preparation units that don't waste air power



Complete, compact, CROWN "matched units" available in any combination you may require, sizes ¼" through 1".



Hannifin regulator design enables oversized poppet (A) to open to full-pipe capacity in a very short stroke. Direction of flow eliminates chatter. Standard models self-venting.

Hannifin CROWN "Combo" units – filters, regulators and lubricators in any combination – keep compressed air in the "pink of condition" without depriving you of needed air flow.

Crown regulators open fast on demand, close precisely when demand is satisfied, deliver the exact amount of air needed. Their "piston balanced" poppet design, which makes possible a flat, large-area, poppet-type valve with very short stroke, is the reason. The inherent stability of this design – no hunting or chatter – results in multi-million cycle life.

Crown filters have large, reusable filter elements for minimum resistance to air flow. Crown lubricators introduce predetermined amounts of oil into the air stream, automatically. Their design is so responsive to variations in air flow rate that the concealed, tamperproof adjustment is rarely used. This is the easiest lubricator of all to fill, and remote-fill models are available.

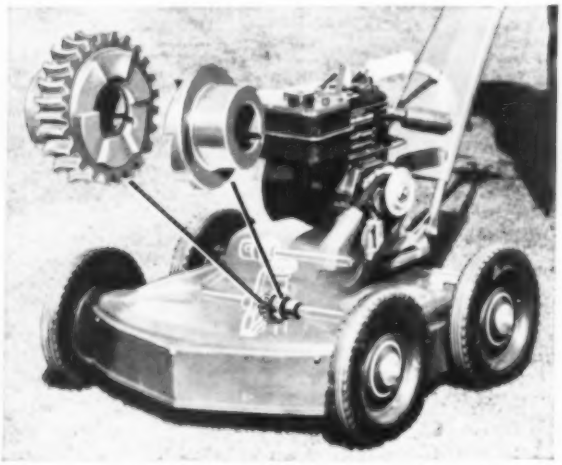
Crown units are competitively priced and stocked in principal industrial areas by Hannifin CROWN authorized distributors. For CROWN literature and the name of the distributor nearest you, write:

HANNIFIN COMPANY

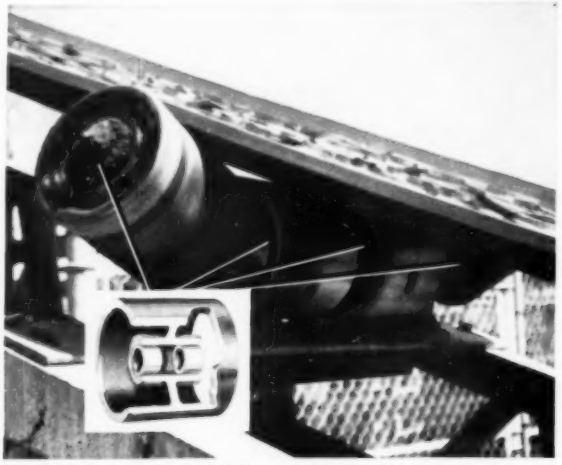
535 South Wolf Road • Des Plaines, Illinois

Lubricator vane (A) is factory pre-set for most applications. Valve (B) shuts off air pressure to bowl when fill plug is removed. This patented Hannifin feature permits bowl refill without shutting down air line.

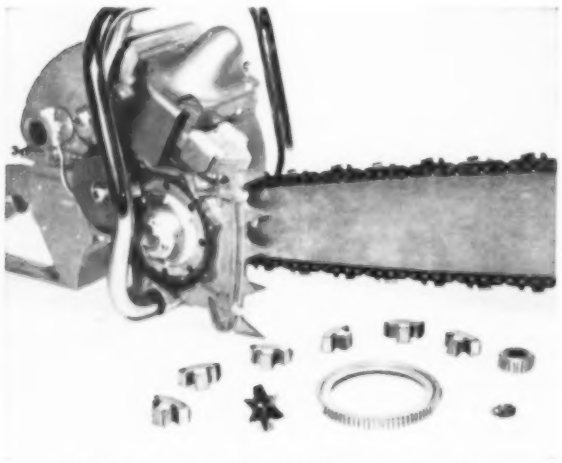
BOOST PRODUCT APPEAL with OILITE



These 2 Oilite components now do the work of 4 former machined parts . . . contribute new economy, less upkeep.



Not one "squeak" from this conveyor . . . yet the dirt-encrusted Oilite bearings haven't been lubricated in 7 years.



Tough, wear-resistant Oilite gears, sprockets and clutch shoes keep costs low . . . make power saw more dependable.

The Oilite pulley of this heavy-duty belt sander provides yet another example of improved performance at less cost.

***Quality-built OILITE*®* parts and bearings add sales appeal to many fine products. For one thing, close tolerance Oilite parts wear less, weigh less and are quieter running . . . and Oilite bearings are tougher, maintenance-free.**

** Only Chrysler Makes Oilite*

For another, Oilite components drastically reduce cost by eliminating material waste and costly machining. Why not contact your Oilite representative today? Look for him in the Yellow Pages under "bearings — Oilite" or write Dept. 1-4.

PM MEMBER SINCE 1927

A CHRYSLER OILITE PRODUCT

the most trusted name in powder metallurgy!

AMPLEX DIVISION

CHRYSLER CORPORATION, DETROIT 31, MICHIGAN

SELF-LUBRICATING BEARINGS • PRECISION PARTS • METAL FILTERS • FRICTION UNITS

Field Report . . .

Fluor Corp Sells Its Metal Manufacturing Facilities

Facilities at Paola, Kans, have been sold by the Los Angeles company to Taylor Forge & Pipe Works, Chicago. About two years ago Fluor developed at Paola a new technique for cold extrusion of steel pipe. Company felt that it would have been too expensive to fully commercialize its cold extrusion processes since it would have involved going into the fitting and flange business and setting up a national sales organization for these products. Taylor makes pipe fittings, flanges, and light wall pipe in the US and Canada. Fluor retains its Paola construction equipment yard as well as the Hartmann Division, manufacturer of pneumatic conveying and unloading equipment.

Pfaudler Permutit Has Bought . . .

. . . Ideal Welding Co Ltd, Toronto metal fabricator. It will be operated as a subsidiary of the Rochester, NY, firm.

Cooper Alloy Installs Radioisotope Machine

Highest-capacity radioisotope machine ever installed in the US is in operation radiographing heavy castings at Cooper Alloy Corp's stainless steel foundry at Hillside, NJ. The Picker Cyclops, manufactured by Picker X-Ray Corp of White Plains, NY, uses as a radiation source for its pictures tiny wafers of Cobalt 60. Unit can radiograph up to a 12-in. thickness of steel to detect any interior flaws. Only other nondestructive way to test such castings would be to use a multi-million-volt X-ray machine the size of a small two-story house.

ASTM Organizes New Division On Materials Sciences

The American Society for Testing Materials, recognizing the need for more emphasis on fundamentals, is organizing a Division on Materials Sciences. The new unit will collect, establish and publish basic information to create a better understanding of materials and their properties, and especially to answer "why" materials are what they are.

Northrop Gets AF Contract

A USAF contract for development of a new multipurpose jet fighter designated the N-156F and designed for use of free allied nations outside the US, has been received by the Norair Division of Northrop Corp, Beverly Hills, Calif. Northrop has carried on the N-156F program as a company project without military contract for several years. The first plane is near completion and is expected to fly this summer.

Solid Fuel Research . . .

. . . for all three stages of the rocket propulsion system of the Air Force's Minuteman ICBM will be carried on by Thiokol Chemical Corp under a $77-million contract. The missile is now in the early development stage. Most of the work will be carried out at the company's Brigham City, Utah, plant, which was built exclusively for solid fuel research and development.

Casting Firm Expands On West Coast

Precision Castparts Corp, Portland, Ore, has recently added 30,000 sq ft of floor space to its plant and has enhanced its research and development activities in the field of high-strength, high-temperature metals. Reported to be the largest precision investment casting plant west of the Mississippi, its facilities have been approved by the Air Force for engineering and designing, tooling, casting, heat treating, testing and inspection of jet engine, rocket, and airframe components. A 50% business volume increase since 1957 necessitated the expansion.

"I'm not either grouchy—I just can't ever think of anything pleasant to say, is all—"

A FREE COST-CUTTING CONSULTANT

Your local Industrial Distributor has gained wide experience in serving many industries and in providing solutions to a variety of production problems. His service begins with an idea — a cost-cutting idea in the form of a product or method which he is willing to suggest at no charge to you.

A COST-CUTTING TOOL

He frequently recommends Anderson wire brushes for those jobs requiring production efficiency with top quality results.

For lowest cost per unit processed select: Anderson.

Write for complete catalog of wire brushes with detailed selection and operation data.

Anderson

ANDERSON CORPORATION
1056 Southbridge Street
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WH-A-A-A-T...
THROW AWAY

THE LEAD SCREW?

"I think the boss is cracking up!

"He says he's got a new way to close up my centerless grinding tolerances to ± .000025" . . . and still turn out better work faster! How can anyone do that, I ask you?

"He says this new gadget—the INCHWORM Motor—will eliminate the lead screw, and get rid of backlash too.

"He's gotta show ME—before I believe what he says about this—what was it—INCHWORM?

"Here's what he claims the INCHWORM Centerless Grinder Control will do for us!!!"

- **Hold Closer Tolerances—**
  by eliminating lead screw backlash
- **Increase Production Rate—**
  by providing "space age" control of grinder
- **Eliminate Rejects—**
  by positioning regulator wheel slide more closely
- **Increase Operator Efficiency—**
  by reducing operator set-up time and supervision
- **Increase Profits—**
  by making final assembly easier

Growth Potential

The INCHWORM is the basic part of a self correcting machine control system. Just add the *MICROtrol* building block elements, set the controls and it will produce parts to sub-micron tolerances automatically. *MICROtrol* elements control the production cycle by electronically inspecting each piece, feeding back the necessary correcting information, actuating the INCHWORM Motor to make the correction, and sorting the finished pieces as they come off the machine.

AT NO EXPENSE TO YOU . . .

The INCHWORM Motor can be installed on your centerless grinder in less than an hour—and prove itself almost immediately. We will install it in your plant, on approval, *upon the recommendation of our sales engineer.*

Send for the complete story!

AIRBORNE INSTRUMENTS LABORATORY

1345 NEW YORK AVENUE, HUNTINGTON STATION, L. I., NEW YORK

A DIVISION OF CUTLER-HAMMER, INC.

CIRCLE 320 READER SERVICE CARD

FEEDCISION

INCREASES CENTERLESS GRINDING PRODUCTION

200%

YES

300%

With This New Automatic Infeed Grinding Attachment

Utmost precision in grinding and duplicate sizing. Sizing dial is graduated in (.00001) one hundredth of a thousandth of an inch. No hydraulic checking cylinder to change feed rate when oil is cold. No checking of oil level or refilling of hydraulic checking cylinder. Three (3) different feed rates are available in one unit for the fastest, most efficient, and precise sizing in a centerless grinder.

CAN BE USED FOR TRU-FEED AS WELL AS INFEED for close sizing. Ideally located push button control station consists of Stop-Button, Caution Pilot Light, and a selector switch for set up or auto grinding positions. **CATALOG** — Write for it today!

MODERN DEVICES

Subsidiary of

TWENTIETH CENTURY MFG. CO.

Box 429 A Libertyville, Illinois

Open Territories for Manufacturers' Representatives

Free Literature

To order any of these bulletins, circle corresponding number, inside back cover.

MACHINES AND ATTACHMENTS

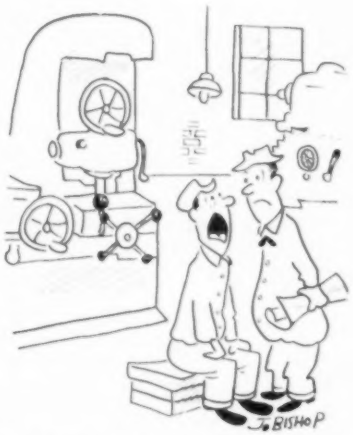
• UNIVERSAL MACHINE TOOL — *Kearney & Trecker Corp, 6784 W National Ave, Milwaukee 14, Wis.* 23-page illustrated manual WS-59 presents detailed information on the Milwaukee-Matic, a tape-controlled single unit production center capable of automatically performing milling, drilling, reaming, tapping, and boring operations in any sequence on several sides of a work-piece with a single setup. With its accessory shuttle loading mechanism it can also absorb loading, setup and changeover time to attain max machining efficiency. Graphic data provided on how to evaluate a new tool and its concept vs present conventional machines and methods. Request direct on company letterhead.

1 UNIT-TYPE BORE-MATIC — *Heald Machine Co, 7 New Bond St, Worcester 6, Mass.* 16-page brochure shows 14 different setups to illustrate how various operations can be combined on a Model 0 Bore-Matic for automatic machining simultaneously or in sequence. Operations include straight and taper boring, straight and taper turning, facing, chamfering, grooving diameters and faces, and reaming. Unit may also be used with special attachments for contour or spherical boring or turning and slot milling.

2 NUMERICAL CONTROL SYSTEMS —*Farrand Controls, Inc, 4401 Bronx Blvd, New York 70, NY.* 32-page illustrated bulletin ER-312/1 explains principles and applications of the Inductosyn, an automatic machine tool control system for micro positioning that uses inductive coupling between conductors separated by a small air space to accurately measure and control angles and linear distances. Describes both linear and rotary types available, plus various applications. System can be adapted to new machine tools or to automate existing machine tools of various types and sizes.

3 THREAD ROLLING HEADS—*Landis Machine Co, Waynesboro, Penna.* 6-page bulletin F-99-1 contains, in addition to information on No. 5 Series, detailed data on No. 7 Series stationary and revolving heads having a right hand range of 7/16 to 7/8 in. NC and NF. Design and operating features covered, together with illustrations and specifications.

4 MODULAR MACHINES—*Cleveland Hobbing & Machine Co, 1911 Chardon Rd, Cleveland 17, Ohio.* 16-page illustrated bulletin 204 gives specifications and engineering data on components for base unit that permit creation of almost any turning-type machine tool.



"But I'm not loafing . . . I'm mapping strategy!"

5 GRINDING AND BUFFING MACHINERY — *Cincinnati Electrical Tool Co, 355 Mt Hope Ave, Cincinnati 4, Ohio.* 28-page catalog 59 presents descriptive information, illustrations, and specifications on pedestal, snagging, disk, lathe, and carbide tool grinders; buffing and polishing lathes; dust collectors; abrasive cutoff machines; speed lathes; and special machinery components for grinding, polishing, milling, drilling, and boring.

6 TRACER CONTROL—*General Electric Co, Schenectady 5, NY.* 8-page bulletin GEA-6122 illustrates and describes GE systems for a wide variety of metalworking applications including vertical boring mills, skin milling machines, center-drive lathes, turret lathes, and contour profile milling machines. Numerical positioning and numerical contouring controls are also discussed.

7 HEAVY-DUTY METAL CUTTING MACHINE—*DeWalt Division, American Machine & Foundry Co, Lancaster, Penna.* 8-page catalog SP-110-57A presents information on new Imperial line of radial-arm machines. Design and operating features illustrated, specifications included.

8 PRESSES—*Dake Corp, Grand Haven, Mich.* 16-page general catalog 350A covers complete line including electric, air and hand-operated hydraulic presses, arbor and utility units, and custom-engineered models for specialized requirements. Features, accessories, and specifications on standard line included; typical custom press applications illustrated.

9 TOOL GRINDING AND LAPPING MACHINES—*Carl Hirschmann Co, 30 Park Ave, Manhasset, NY.* 4-page brochure contains illustrated description of Agathon units especially designed for grinding and lapping carbide turning tools for Swiss automatics, turret automatics, copy lathes, and precision toolroom lathes. Specifications and operating details included.

10 GEAR SHAVING MACHINES—*National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich.* 12-page bulletin S51-11 pictures and describes Red Ring units for internal-external shaving of gears up to 100 in. PD. Features, specifications included.

11 POWER SHEARS—*Famco Machine Co, 3100 Sheridan Rd, Kenosha, Wis.* Illustrated bulletin gives information on Hi-Speed line incorporating pneumatic friction clutch and brake. PC Series operates at 300 spm, completes one stroke in 0.20 of a second. Four models described with specifications.

TOOLS AND ACCESSORIES

12 CEMENTED CARBIDE CUTTING TOOLS—*Kennametal Inc, Latrobe, Penna.* 64-page pocket booklet, Kennametal Tool Manual No. 7, includes revision of the grade and cutting speed table to incorporate harder carbide grades and revised recommendations for machining various materials. Tool Wear Analysis and Grade Check Chart has been updated, and the problem-and-solution section has been enlarged to cover throwaway insert tooling.

13 TOOLS—*Apex Machine & Tool Co, 1026 S Patterson Blvd, Dayton 2, Ohio.* 206 pages of data are available in four separate catalogs: 30-A, nut running tools ¼ to ⅝-in. hex and square drives; 30-B, nut running tools ⅜ to 3½-in. square drives; 30-C, screwdriving tools; 30-D, miscellaneous production and fastening tools.

14 CARBIDE THROWAWAY INSERTS AND TOOLHOLDERS — *Pratt & Whitney Co, Charter Oak Blvd, West Hartford 1, Conn.* 20-page bulletin 625 covers

Suffixes and prefixes with a cylindrical roller bearing number spell a big difference in price and service . . .

Cylindrical roller bearings are manufactured in the variations shown above, as well as many others. They are supplied with separators of cast bronze or pressed steel. Some have a full complement of rollers, no separators.

Each *can* be called interchangeable with the other, yet *none* are. All variations are priced differently and each is designed to fit particular applications.

If you buy or authorize replacement bearing purchases, make certain you order by *all* suffixes and prefixes . . . Bearings, Inc. have complete stocks of all types in all sizes and can advise which is best for each application . . . Buy with confidence that the bearing you order will be the bearing you get. Call our nearest branch.

1. *Straight inner race; separator; retaining rings in outer race.*
2. *Single flanged inner race; separator; retaining rings in outer race.*
3. *Double flanged outer race; bronze separator; single flanged inner race.*
4. *Double flanged inner race; straight outer race; bronze separator.*
5. *Straight inner race; double flanged outer race; bronze separator.*
6. *Double flanged inner race; single flanged outer race; retainer on opposite side; non-separable; steel retainer.*
7. *Double flanged inner race; single flanged outer race, retainer on opposite side; non-separable; full roller, no separator.*

Providing bearing service in the North ➤ **BEARINGS, INC.**

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Another RCA AUTOMATION Product for Better Materials Handling

Low cost automatic RCA ROTARY HOPPER

Compare the cost and features of these new RCA Automatic Rotary Hoppers, and you'll see why they are gaining such rapid acceptance! They provide every needed operating feature, yet are offered at remarkably low prices . . . beginning at $265, f.o.b., Detroit.

Features:

- **High-speed—up to 20,000 parts per hour.**
- **Handles cylindrical, rectangular, headed disc shaped and other parts.**
- **Parts orientation performed by feed track, not the bowl.**
- **Feed tracks easily changed by loosening one screw.**
- **18", 24", 30" bowls available.**
- **Rugged construction—cast-iron frame; driving mechanism supported by heavy duty self-aligning bearings.**
- **Standard gear-head motor.**
- **Safety-slip drive protects parts and equipment.**
- **Price includes cleats on selector ring and mounting block for tracks.**
- **Demand-control mechanism and wide variety of discharge tracks furnished at modest extra cost.**

Write today for complete information on low-cost RCA Rotary Hoppers. To permit analysis of your needs, send two samples of each part to be handled, and indicate required production rates. Details of other RCA Automation Equipment available on request.

RCA Tmk(s) ®

RADIO CORPORATION of AMERICA

INDUSTRIAL AND AUTOMATION DIVISION

12605 Arnold Ave., Detroit 39, Mich.

Free Literature

To order any of these bulletins, circle corresponding number, inside back cover.

triangular, square, and round inserts; clamp, broached, and milled-type holders; and manufacturers' carbide grades table. Dimension and engineering data tabulated.

15 GRINDING WHEEL SAFETY CHART—*Carborundum Co, Walmore Rd, Niagara Falls, NY.* 12 x 12-in. wall chart lists ten Do's and Don'ts of grinding wheel safety.

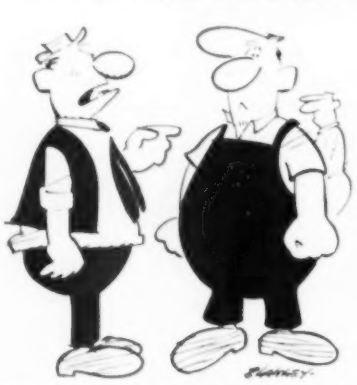
16 WINDOW UNITS FOR LUBRICATING SYSTEMS—*Bijur Lubricating Corp, Rochelle Park, NJ.* 4-page illustrated bulletin 8-E provides information on units used to indicate level of oil or other noncorrosive liquid in reservoir, or observation of liquid flow or internal parts through a clear window. Includes specifications and installation data, illustrations of three types available, together with pictured applications.

• STOCK EXTRUSION DIES—*White Metal Rolling & Stamping Corp, 92 Moultrie St, Brooklyn 22, NY.* Catalog contains dimensioned diagrams of several thousand dies in a wide range of extruded mill products made of Whitelight magnesium and aluminum. Includes rods, bars, tubes, structurals, solid shapes, hollow and semi-hollow shapes. Request direct on company letterhead.

17 INSPECTION UNIT — *Cartriseal Corp, 3515 W Touhy Ave, Lincolnwood, Ill.* 4-page folder illustrates and describes the Cartrilamp, a monochromatic light source which, when used with company's coated Centriflat optical flats, shows surface flatness at a glance. Work to be checked is placed face down on top of the Cartiflat, not under it. The flat remains mounted on the table at all times. After part is placed on the flat, it can be checked in the viewing mirror, and inspection is completed.

18 BORING BARS—*Wesson Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich.* 8-page illustrated bulletin MB-1158 describes more than 114 standards; gives specifications for two lines of micro-adjustable and two lines of nonadjustable boring bars, all using standard throwaway carbide inserts. Also pictured are suggestions for combining boring and other operations with special tools using throwaway inserts and replaceable insert holders.

19 TEMPERATURE CONTROLS—*Fenwal Inc, Ashland, Mass.* 8-page booklet MC-177 contains description of Thermoswitch controls and mounting wells. Discusses how units operate on the differential



"To err is human, but not as often as you err."

expansion of metals; includes specifications and dimensions, available modifications and special features.

20 DIAMOND WHEELS FOR CARBIDE GRINDING — *Carborundum Co, Walmore Rd, Niagara Falls, NY.* 4-page brochure A-1504 5M covers wheels (both natural and man-made diamonds) for carbide grinding. Discusses bond types, infeed and table speeds, wet grinding, diamond concentration, types of wheels. Recommendations listed on the six most common applications.

21 ANTI-FRICTION LUBRICATING COMPOUNDS—*Whitmore Mfg Co, Cleveland 4, Ohio.* Folder gives information on uses and applications of two new compounds said to have no melting or dropping point. Information includes test data and performance characteristics of products designed to provide constant protection to roller, ball and sleeve bearings, sliding surfaces in hot bearing applications, or in areas with high ambient heat.

22 TEMPERATURE-MILLIVOLT CONVERSION CHART—*Thermo Electric Co, Saddle Brook, NJ.* Chart listing conversion tables makes it possible to convert either Fahrenheit or Centigrade temperatures in 5 degree increments to millivolt values for eight different thermocouple calibrations in a matter of seconds. Temperatures from -320 to +3270 F, and -200 to +1800 C are covered.

HEAT TREATING AND WELDING

23 PRESS WELDERS—*Federal Machine & Welder Co, Warren, Ohio.* Illustrated brochure P59 covers line of press spot and projection welders. Describes and gives specifications for four available sizes in capacities from 30 to 500 kva.

24 METAL-ARC WELDING ELECTRODE — *Whitehead Metals, Inc, West 10th & Washington Sts, New York 14, NY.* 6-page bulletin gives data on Inco-Weld A electrode for welding dissimilar alloy combinations, and Inco-Weld A wire for MIG and TIG welding. Advantages, applications, results discussed; typical weld properties obtained with both are presented in tabular form.

25 VACUUM ARC FURNACE — *NRC Equipment Corp, 160 Charlemont St, Newton 61, Mass.* Data sheet gives details on unit that can be used to produce shaped castings and ingots of titanium, zirconium, and other hard-to-melt metals for production or lab use. Model 2703 is quickly convertible from consumable to nonconsumable melting and between use of either skull or cold mold. Includes application data, operational and design features, and specifications.

26 RESISTANCE WELDING — *Resistance Welding Alloy Association, 1900 Arch St, Philadelphia 3, Penna.* Brochure discusses time and money-saving advantages of production by this welding process, and the role of quality electrodes and specialized alloys in production progress.

PLANT SERVICE EQUIPMENT

27 ROLLER AND WHEEL CONVEYERS—*Mathews Conveyer Co, Ellwood City, Penna.* 68-page spiral-bound catalog 158 illustrates and describes light and heavy-duty wheels and a complete line of conveyor rollers, the latter ranging in diameter from 1⅜ to 6½ in., and in capacity from 60 to 16,000 lbs. Roller conveyor specifications tabulated, as well as load ratings for frame rails.

28 VIBRATION AND NOISE CONTROL—*Felters Co, Unisorb Division, 210 South St, Boston, Mass.* 6-page engineering data folder provides information on simplified machine installation and vibration control through use of Unisorb pads

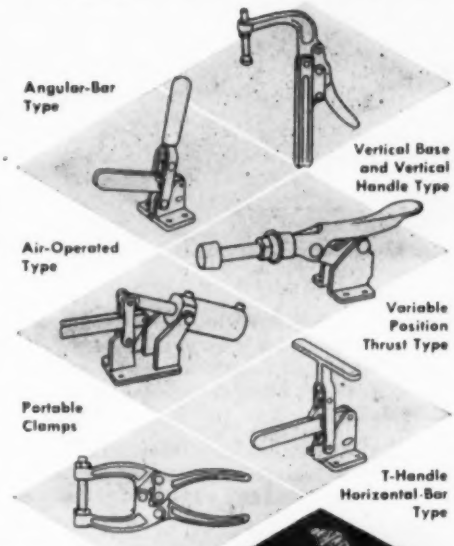
(continued on page 217)

Where It's Quality, Quality, Quality!
It's Quality DE-STA-CO Toggle Clamps

FINAL INSPECTION OF ROSS OPERATING VALVES subjects every valve to a pressure test far exceeding its normal usage. For over fifteen years, fixtures similar to this, all employing De-Sta-Co No. 620 plunger clamps, have been built to do this critical high pressure sealing job.

Whether your holding and clamping operation is inspection, machining, tapping, grinding, welding, bonding or other assembly, there is a specific De-Sta-Co Toggle Clamp to do it better. Fast action, positive clamping, long life through thousands of production operations have made De-Sta-Co known for almost 30 years as the leading tool in the field. And all of our medium and larger models use hardened serrated pins in hardened bushings staked to prevent wear. A broad selection of spindle accessories increases the versatility of the clamp you specify.

Our representative in your area is qualified and ready to serve you. Send for our catalog showing clamp applications, scale drawings and complete information.



DE-STA-CO

ORIGINATORS OF PRODUCTION CLAMPING

De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

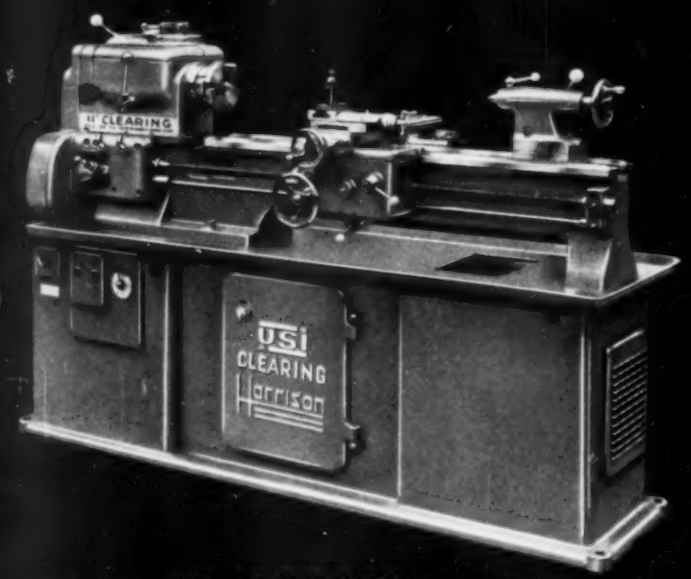
DETROIT STAMPING COMPANY

343 MIDLAND AVENUE • DETROIT 3, MICHIGAN

NOW CLEARING THE BIGGEST LATHE

the NEW

CLEARING-HARRISON



11"–$1,950.00*

11", 13" AND 16" COPYING LATHES ALSO AVAILABLE

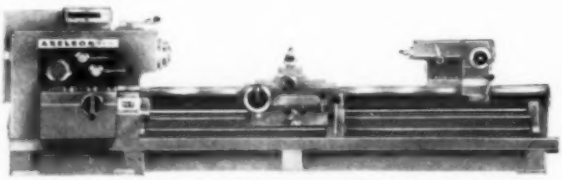
The Harrison line is produced exclusively for Clearing to our specifications. We sincerely believe these to be the finest lathes of their type that can be produced. And their price is at least 30% below the normal price range for machines of this kind.

The Harrison has taper roller bearings in the spindle; hardened and ground ways; precision hobbed, heat treated nickel-chrome gears and a host of features and accessories found only in the most carefully engineered machine tools.

These lathes are readily available from stock at Clearing. Complete stocks of repair parts and accessories are available through Clearing's three plants and at all service centers.

If you are looking for outstanding quality at a low, low initial cost, be sure to investigate the Clearing Harrison. It's the nation's greatest lathe value.

Clearing, division of U. S. Industries, Inc., also manufactures the Axelson line of engine lathes, power presses of all types, dies and special tooling, and special equipment for the aircraft and missiles industry.



Shown, the new all-steel Clearing-Axelson lathe, Model 2516

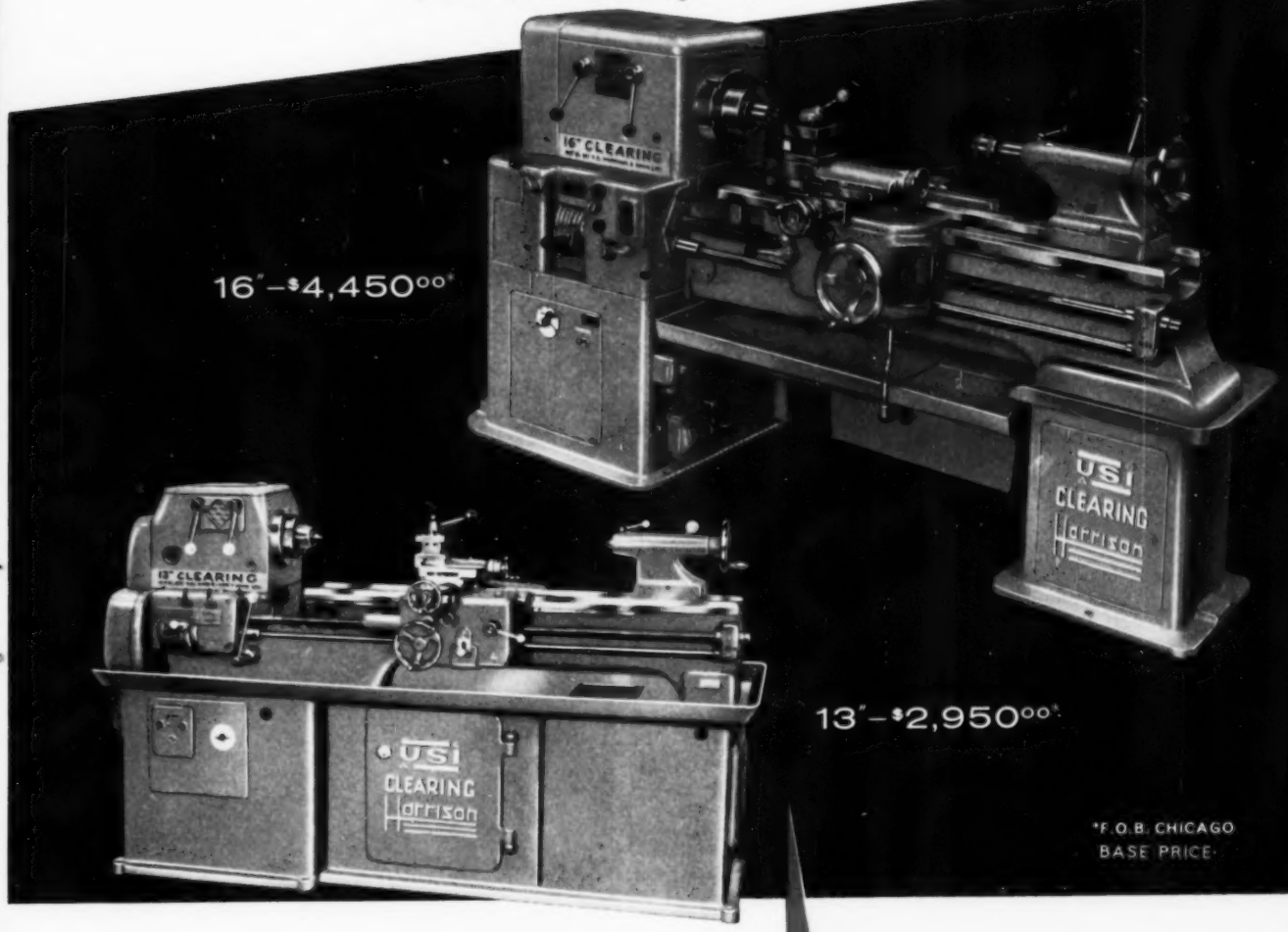
USI Clearing

DIVISION OF U. S. INDUSTRIES, INC.

6499 W. 65th Street • Chicago 38, Illinois

Plants in: Chicago, Ill. • Hamilton, Ohio • Los Angeles, Calif.

BRINGS TO AMERICA VALUE *EVER!*



16"–$4,450.00*

13"–$2,950.00*

*F.O.B. CHICAGO
BASE PRICE

Coast to Coast Service Facilities

Clearing's nationwide facilities assure you of prompt service always. Replacement parts and accessories are stocked at Clearing and are available through all three plants, at all service centers and through all Clearing dealers.

I'm interested. Send full particulars on Clearing's Harrison line.

Name_____

Title_____

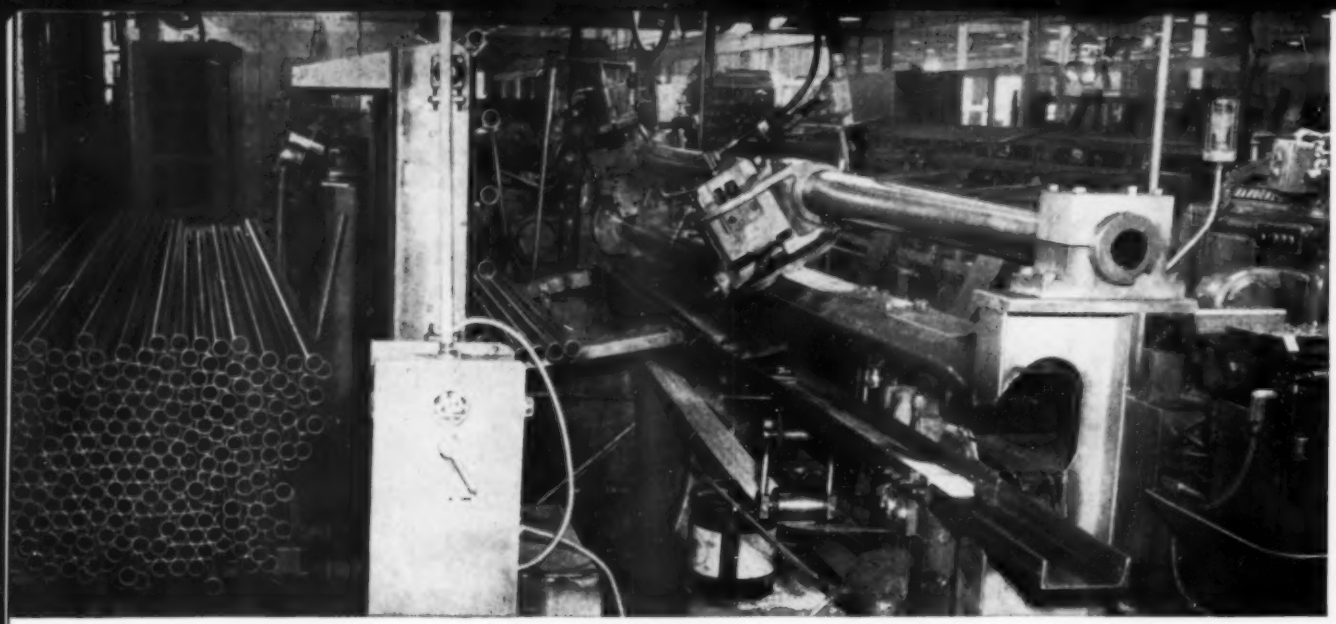
Company_____

Street_____

City_____ Zone____ State_____

SEE YOUR DEALER FOR AN ON-THE-SPOT DEMONSTRATION.

CIRCLE 226 READER SERVICE CARD

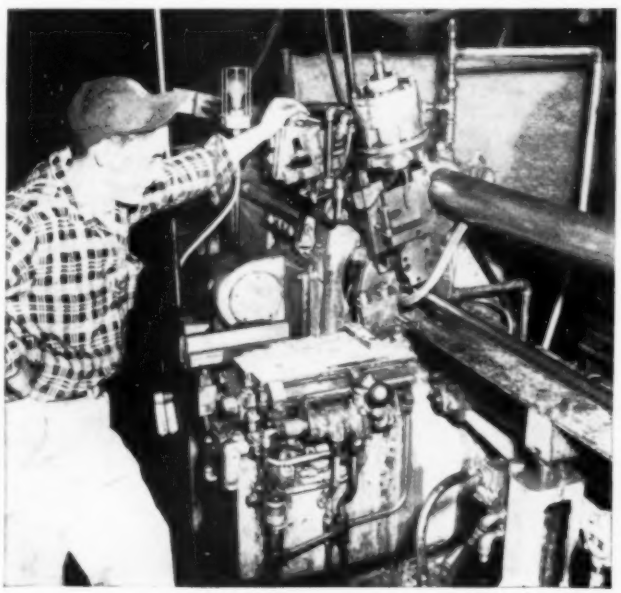


"Flexible Automation"

WITH BARDONS & OLIVER CUTTING-OFF LATHES

at Falls Steel Tube & Manufacturing Co., Newton Falls, Ohio

At Falls Steel Tube & Mfg. Co., manufacturers of exhaust pipes, tail pipes, and similar automotive tubular parts, the output of two electric weld tube mills is automatically transferred to three Bardons & Oliver loading tables. The tubing is then fed into three Bardons & Oliver Cutting-Off Lathes and automatically cut off in any required length from 6 inches to 10 feet. The cutoff lengths are automatically unloaded into tote trucks. Besides wide variance in length, tubing diameters vary from ½ to 3 inches and wall thickness from 14 to 20 gauge.



Victor Beltram, Chief Engineer, reports labor reduced by 75% and cutoff capacity increased by 50% with the Bardons & Oliver installation. Previously, cutoff operations were performed on circular sawing machines. The cutting-off lathes produce square ends and smooth finishes which have greatly facilitated secondary operations. The increased cutoff capacity has allowed greater utilization of all plant facilities. The complete Bardons & Oliver installation has paid for itself in less than three years.

If you cut off spacers, bushings, nipples, couplings, rollers, similar tubular products, or solid bar stock, we suggest you explore the profit possibility offered by these versatile machines. Bardons & Oliver manufactures a complete line of Cutting-Off Lathes ranging in collet capacity from 2 to 16 inches.

BARDONS & OLIVER

BARDONS & OLIVER, INC., 1134 WEST 9th ST., CLEVELAND 13, OHIO

Manufacturers of Turret Lathes and Cutting-Off Lathes

CIRCLE 227 READER SERVICE CARD

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

made in a variety of densities and thicknesses. Includes applications, advantages, general recommendations, plus directions on a do-it-yourself leveling mount, and description of two types of self-contained leveling mounts called the Level-Rite and the Level-Rite Model 200.

29 LIGHTED INDICATOR AND PUSH-BUTTON SWITCH DEVICES—*Micro Switch, Division of Minneapolis-Honeywell Regulator Co, Freeport, Ill.* 20-page catalog 67 presents detailed information on Series 2 system designed for control panels. Parts simply snap together to form combination switch-indicator devices. Split pages allow quick selection and comparison of the operator units, indicator units, and switch units. Full dimension drawings of all major items included, plus technical information on lighting, indication, mounting, and arrangement.

30 FLEXIBLE HOSE — *Flexaust Co, 100 Park Ave, New York 17, NY.* Bulletin 83 contains information on and illustrates applications of Portovent duct hose for air handling. Bulletin 84 covers hose for use in fume control.

31 CLOSED-CIRCUIT TV EQUIPMENT —*Cohu Electronics, Inc, Kin Tel Division, 5725 Kearny Villa Rd, San Diego 11, Calif.* 8-page illustrated bulletin 6-103 describes complete line, illustrates systems now in use. Pictures a variety of cameras, camera housings, pan-tilt mechanisms, control panels, monitors, and other components for assembling complete systems.

32 FINISHING EQUIPMENT — *R C Mahon Co, East 8-Mile Rd, Detroit 34, Mich.* 12-page catalog A-659 presents illustrated descriptions of complete finishing systems. Major units of equipment incorporated in the systems are pictured and discussed in detail.

PARTS AND MATERIALS

33 VARIABLE-SPEED PULLEYS — *T B Wood's Sons Co, Chambersburg, Penna.* 12-page bulletin 4101 describing line designed to eliminate freezing and sticking contains technical data on five MS sheaves for ratings of 2, 3, 5, 10, and 15 hp. Power is transmitted from the stationary flange through a removable sleeve cap which is keyed to the moving flange by torsionally resilient rubber keys. Construction features illustrated, specifications included.

34 TOOL STEELS—*Brown & Sharpe Mfg Co, Providence 1, RI.* 15-page form M80 contains information on B&S Ready Mark for oil or air hardening. The pre-colored precision tool steel, ready for marking, and permanently identified by its

"What a beautiful, glorious, wonderful day . . . call the plant and tell them I'm sick."

Dial a hole in a jiffy with this new Di-Acro Turret Punch Press. Micrometer front operated back and side gauges provide instant gauging.

new Di-Acro turret punch press*

Accurate Burr-Free Punching at 12 Rotating Stations

The new Di-Acro 4 Ton Turret Punch Press provides rapid, close tolerance punching of round, square, oval and rectangular holes from 1/16″ to 2″.

Rotating turrets provide rapid indexing for single or sequence punching. Precision hole location quickly obtained with Micro-twin gauges. Punches sheet metals up to 16 gauge mild steel, fibreboard, asbestos, paper, cork, leather, rubber, plastic and other sheet materials.

Dies are mounted in turrets—always handy. Standard clearance between punch and die is .002″. Choice of 6 other clearances at no charge. The Di-Acro Turret Punch Press is safe, simple to operate—requires little maintenance.

Find Us Fast in The Yellow Pages

Consult the Yellow Pages of your phone book under Machinery, Machine Tools for the name of your nearest Di-Acro distributor or write us for quick facts folder describing this and other Di-Acro machines.

di-acro PRECISION METALWORKING MACHINES

*pronounced die-ack-ro

O'NEIL-IRWIN MFG. CO.

381 8th Avenue • Lake City, Minn.

CIRCLE 328 READER SERVICE CARD

Get your NEW 148 page

Atrax "STANDARD REFERENCE"

on Precision Ground

SOLID CARBIDE TOOLS and BURS

Send for your copy **NOW!**

- World's largest line of Solid Carbide Tools
- 1230 "standard" stock Tools and Burs
- The easiest catalog to use ever published
- New Solid Carbide Tool "Standards"
- New Speed and Feed charts
- Selection and use of Carbide Tools
- Machining recommendations for all tools
- 148 new fact packed pages
- Thousands of production hints

Atrax **THE ATRAX COMPANY**

Newington 11, Conn.

Free Literature

To order any of these bulletins, circle corresponding number, inside back cover.

color, is rust resistant, has excellent machinability; heat treatment eliminates the color. Sizes, ordering numbers, and prices are tabulated.

35 HELICAL GEAR MOTORS—*General Electric Co, Schenectady 5, NY.* 16-page bulletin GEA-6704 presents illustrated description of construction features and applications of gear motors and speed reducer line.

36 CONTROL VALVES—*Hunt Valve Co, Salem, Ohio.* 4-page bulletin 581 illustrates and describes new Slim Line valves that are 1 in. thick by 3 in. wide. Units mount conveniently on any machine and are easily manifolded into compact control centers. Available in ⅛ and ¼-in. sizes; 3-way and 4-way actions; solenoid, hand-lever, and ball-actuated models.

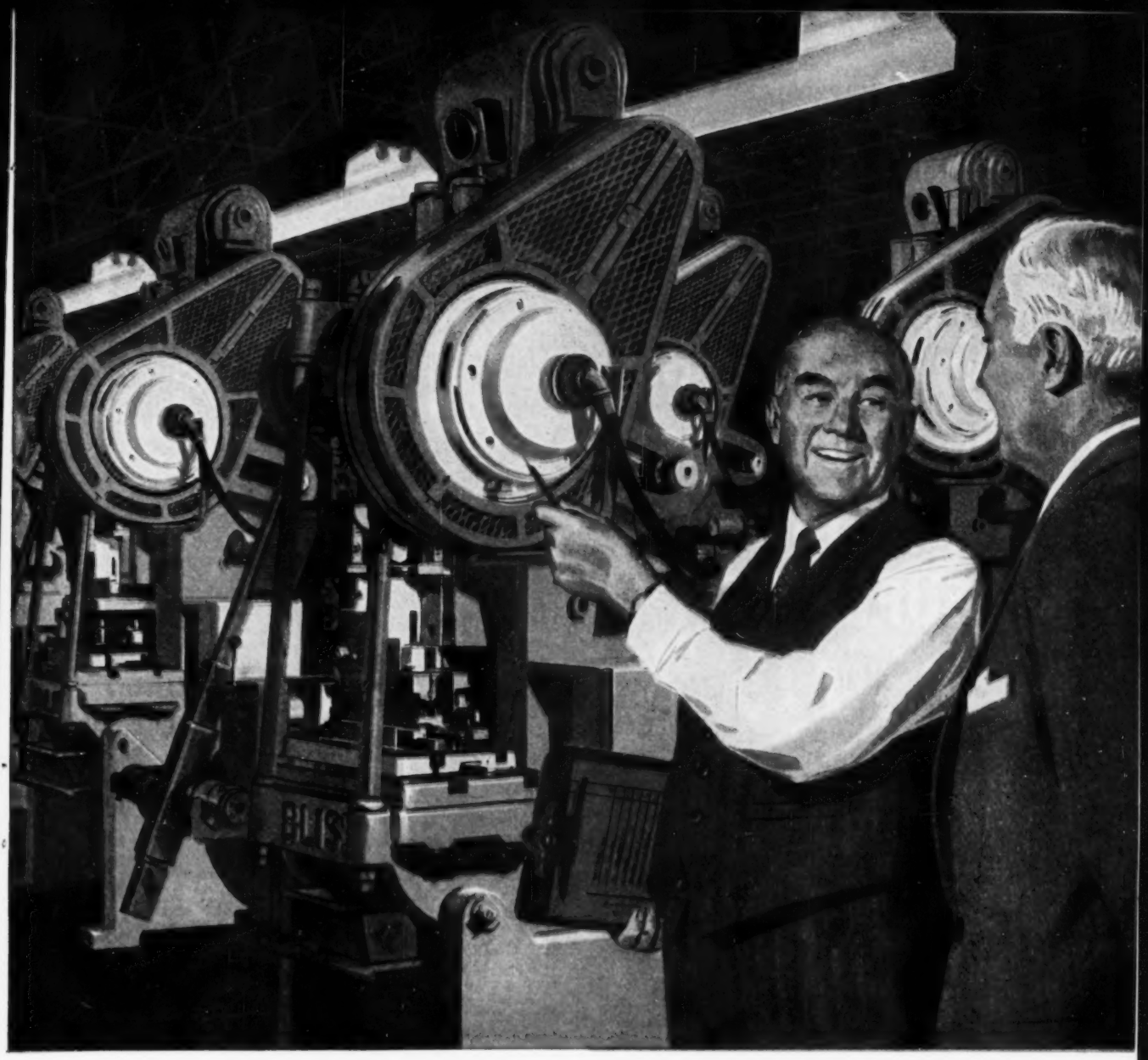
37 FASTENERS—*Albany Products Co, 951 Connecticut Ave, South Norwalk, Conn.* 8-page product bulletin provides data on complete lines of commercial AN and MS fastenings. Over 70 different AN and MS specifications are covered as well as grades of stainless steel available. Nonferrous fasteners in monel, silicon, bronze, brass, and aluminum are also included.

• BRASS ROD MILL PRODUCTS—*Titan Metal Manufacturing Co, Bellefonte, Penna.* 24-page pocket-size booklet contains weight, size and tolerance tables, specifications, and technical data on free-cutting brass, commercial bronze, nickel-silver, high silicon brass, manganese bronze, forging rods and shapes, brass wire. Request direct on company letterhead.

38 UNIVERSAL JOINTS—*Curtis Universal Joint Co, Birnie Ave, Springfield 7, Mass.* 9-page catalog C4-10M-12-58 covers entire line of single and double units. Contains instructions for disassembly, reassembly and lubrication; key seats, setscrews and broaches available; selection hints; conversion table between static torque inch-pounds and horsepower at 100 rpm; decimal equivalents; plus prices and specifications.

39 CERAMICS—*Duramic Products, Inc, 262-72 Mott St, New York 12, NY.* Data sheet 118 describes Grade HT-2-M, a readily machinable high-temp, heat shock resistant material with max operating temp of 2200 F.

"Sure, at first, I thought this was a great place to work, too . . . then, as I left the employment office. . ."



"These 'super-speed' inclinables give me twice the production . . . at about half the cost!"

From their special vibration-absorbing legs to their counterbalanced shafts, these presses are built for speed.

With such special features as bronze gibs... automatic lube systems... special clutches, brakes and flywheels, and equipped with precision feeds, they can knock out short stroke work at better than 500 strokes a minute! They're all new, all Bliss, and the cost is low—surprisingly so.

These are the latest members of Bliss' line—the line that offers industry its most complete choice of types and sizes. And with no axe to grind for any one type, you can be sure of impartial pressroom counsel—by Bliss.

BLISS
SINCE 1857

E. W. BLISS COMPANY · Canton, Ohio

100 years of making metal work for mankind

PRESSES • ROLLING MILLS • ROLLS • DIE SETS • CAN MACHINERY • CONTRACT MFG.

CIRCLE 330 READER SERVICE CARD

"Surface Finish On These Clips Has To Be SUPERIOR!"

Robert Daly, Finishing Supervisor, holds sparkling Arrow pen clips finished in one of the nine ALMCO barrel finishing machines used by The Parker Pen Company.

BECAUSE THE ARROW is a trademark of The Parker Pen Company, the surface finish on each of these distinctive pen clips has to be more than just good. *It has to be superior!* What's more, production must be high and costs must be low.

That's why The Parker Pen Company now has *nine* ALMCO precision barrel finishing machines running *around the clock* in their parts deburring and finishing department. Used for cutdown operations, descaling after heat treatment, deburring and polishing, the scientific ALMCO Supersheen method helps the Parker people to meet high standards of quality, reduce costs and increase production, simultaneously!

Perhaps ALMCO finishing methods can do as well for you. It's no trick at all to find out. Just write us on your letterhead asking for an ALMCO sales engineer to call. Or, send sample parts and specifications on results desired direct to ALMCO's main laboratory at Albert Lea, Minnesota.

Meanwhile, send today for your FREE 52-page **SUPERSHEEN** barrel finishing handbook. Profusely illustrated.

Even though the nine ALMCO machines are in use 24 hours a day at Parker Pen, operators report that little maintenance is required to keep them in top-notch working order. That saves money, too!

ALMCO

Queen Products Division • King-Seeley Corporation
54 E. Main Street, Albert Lea, Minnesota
SUBSIDIARY OF KING-SEELEY CORPORATION

Sales and Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven and Philadelphia

IN ENGLAND: *Almco Division of Great Britain, Ltd., Bury Mead Works, Hitchins, Herts, England*

E P Bullard 3rd (left), president of the Bullard Co since June 1957, has also been appointed chief executive officer of the company. In this capacity he succeeds his cousin, **E C Bullard,** who will continue as chairman of the board

John R Keates has been elected vice president, sales, of National Automatic Tool Co, Richmond, Ind. He was previously general manager of the Machine Tool Division

NAMES IN THE NEWS...

Stanley B Dowd, vice president of Leland-Gifford Co, Worcester, Mass, has been named president to succeed **William F Leland,** now chairman of the board. **A L Wilkinson** has been elected treasurer in addition to his present duties as executive vice president.

Dr Louis N Ridenour has been elected a vice president of Lockheed Aircraft, and general manager of the company's new Electronics and Avionics Division established to specialize in design, development, and adaptations of electromechanical devices and advanced instrumentation. Dr Ridenour was formerly assistant general manager and chief scientist of the Missiles and Space Division.

Arthur H Van Wormer has been appointed sales manager, industrial products department, of the Machinery Hydraulics Division of Vickers Inc, Detroit. He was formerly district manager of the Detroit industrial sales office

Charles Snyder has been appointed general sales manager of Stone Machinery Co, Manlius, NY. Formerly sales promotion manager, he will direct sales activities for the company's high speed cutoff saws.

James L Harper has been elected vice president, manufacturing, of the City Auto Stamping Co, Toledo division of Globe-Wernicke Industries, Inc. Formerly plant superintendent of the stamping division, he succeeds **Robert Millard** who is retiring after 25 years of service with the company.

Jack Slean has been elected president of Heidrich Tool & Die Corp, Detroit. Mr Slean, who continues as general manager, succeeds **Rudolph Heidrich,** founder of the company, who has retired. **Julius A Schensky,** general plant superintendent, has been named vice president, manufacturing.

Arch T Colwell has been named to the newly created position of vice president, engineering, research, and development of Thompson Ramo Wooldridge Inc, Cleveland. He was formerly vice president of Thompson Products, Inc.

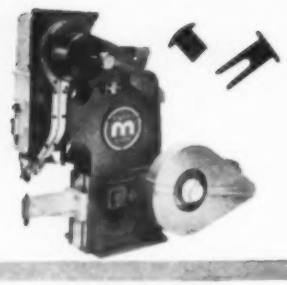
Ralph L Bayless, formerly chief engineer of the San Diego Division of Convair, has been appointed Convair director of engineering. He will supervise activities in all of Convair's operating divisions in California and Texas.

William L Martin has been appointed sales manager for Chrysler Corp's Amplex Division, Detroit, leading producer of powder metal products and manufacturer of Oilite bearings. Mr Martin has been manager of dealer placement for the company's Automotive Sales Group.

Paul J Reeves, director of sales for Timken Roller Bearing Co, Canton, Ohio, has been appointed vice president, sales.

Herbert D DeBorde has been promoted from assistant manager to manager of Burroughs Corp's new Military Electronic Computer Division's Tireman Avenue Plant, Detroit, builder of electronic computers and data processing equipment for the Atlas missile and SAGE continental air defense network.

Arthur E Hamm, treasurer of Union Twist Drill Co, Athol, Mass, has been named a director of the company to replace the late **William E Loy**



CUT RIVET ASSEMBLY COSTS

with Milford's Complete Line of AUTOMATIC RIVETERS

Can be adapted to solve nearly every fastening and assembly problem. For the answers to assembly problems... *get in touch with Milford first!*

THE MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT • HATBORO, PENNA.
ELYRIA, OHIO • AURORA, ILL. • NORWALK, CALIF.

NAMES IN THE NEWS...

Thomas Bannon has been promoted to director of production engineering at Clearing, Division of US Industries, Inc. Formerly chief engineer, he will take on added administrative responsibility relating to both major product lines, presses and lathes

Glen H Stimson has been named chief engineer of the Greenfield Tap & Die Division of United-Greenfield Corp, succeeding **Oscar E Koehler** who has retired. Mr Stimson was formerly sales manager and chief engineer of the Gage Div at GTD.

Kenneth M Chakiris has been appointed sales manager for the Horton chuck line made by United-Greenfield Corp's Geometric-Horton Division, New Haven, Conn. He has been a sales service engineer for Greenfield Tap & Die Division in the Detroit area.

Avard W Taylor has been appointed general sales manager of the Mill Product Division of Carpenter Steel Co, Reading, Penna. He has been serving as district manager of the company's Philadelphia and Atlanta territories.

H I Romnes has been elected president and a director of Western Electric Co, New York. He succeeds **Arthur B Goetze** who died March 9. Mr Romnes has been a vice president of American Telephone & Telegraph Co in charge of operation and engineering.

P A Haythorne has been appointed technical director of Superweld Corp, North Hollywood, Calif, metal fabrication specialist. He was previously chief engineer and manager of product development for the Aircraft Division of Rheem Manufacturing Co.

George A Markell, formerly sales manager of Elwell-Parker Electric Co, has been named product manager of the attachment division of Clark Equipment Co's Industrial Truck Div, Battle Creek, Mich.

Frank J MacRae has been named manager of plastics technical service for Dow Chemical Co, Midland, Mich. Formerly assistant manager, he succeeds **Dr W C Goggin** who has been appointed manager of the Plastics Department.

Milton L Aitken, general sales manager, Robbins & Myers, Inc, Springfield, Ohio, has been elected president of the Hoist Manufacturers Association, Inc. **John S Jackson,** president of Shepard Niles Crane & Hoist Corp, Montour Falls, NY, has been named vice president.

Thomas Trowbridge has been named general sales manager of Behr-Manning Co's Coated Abrasive Division, Troy, NY. He has been a member of the firm since 1922, serving in various sales capacities.

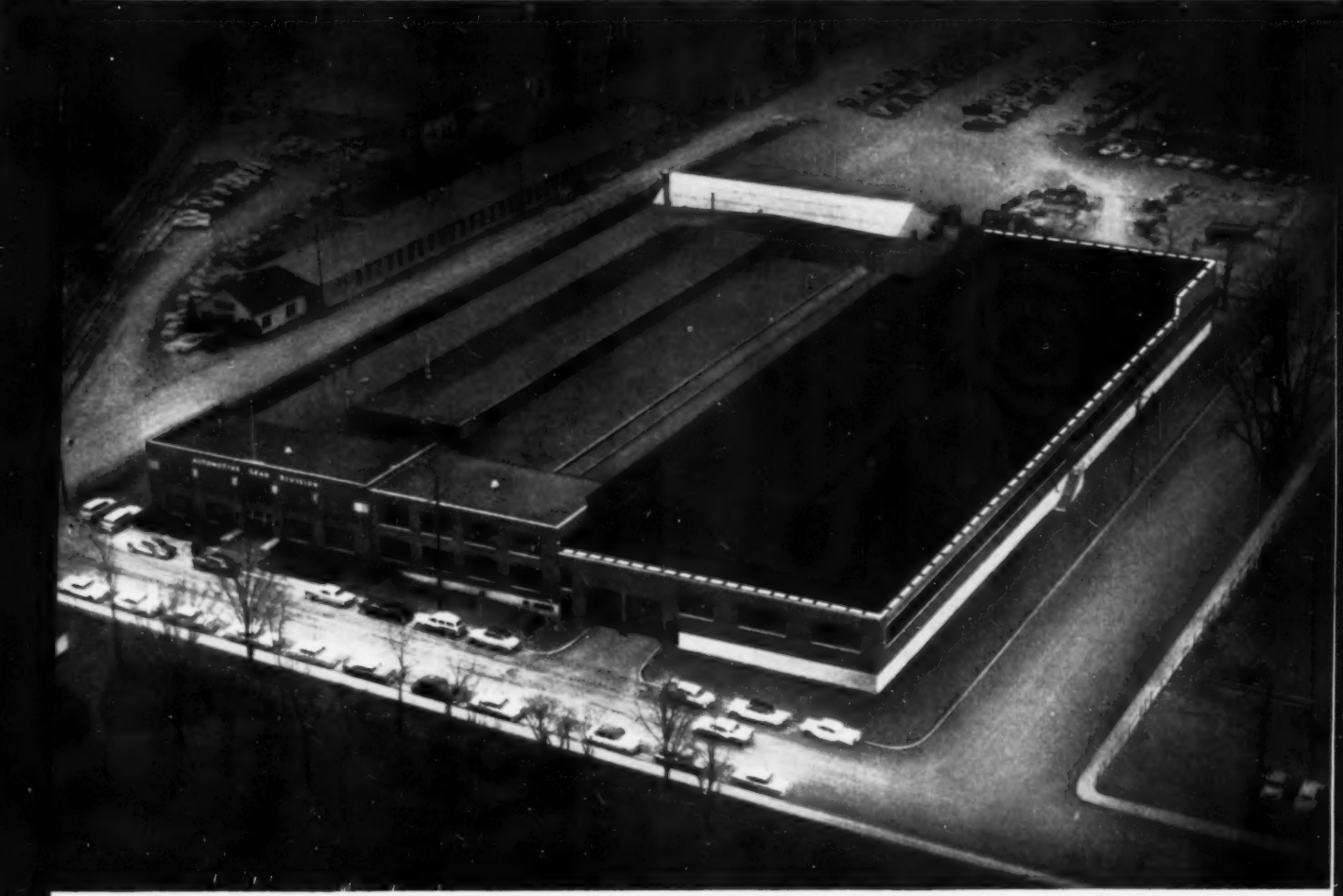
Walter E Stewart has been appointed product engineering director of the American Welding & Manufacturing Co, Warren, Ohio. He has been serving as manager of production engineering.

John M Perkins, formerly promotion manager of American Car and Foundry Division of ACF Industries, Inc, has been named director of industrial product sales.

James W Lewis has joined Swanson-Erie Corp, Erie, Penna, as manager

THIS MUCH MORE in '59

Expansion was not the order of the day during the past year, but it was in this period that the growing sales of "Double Diamonds" required the addition of 60% more manufacturing space. Hence, we now enter the more promising future with better and more facilities to serve as your "gear department" or to fill your gear orders with "Double Diamond" Gears that are built *to produce low installed cost... to serve economically and dependably on the job for which you buy them... and to do credit to your product and your reputation.*



May we send you this catalog of the gear types in which we specialize: helical gears, flywheel starter gears, straight bevel gears, straight spur gears, angular bevel gears, hypoid bevel gears, gear assemblies, zerol* bevel gears, spiral bevel gears, and spline shafts?

*Reg. U. S. Pat. Off.

EATON

AUTOMOTIVE GEAR DIVISION
MANUFACTURING COMPANY
RICHMOND, INDIANA

GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

CIRCLE 333 READER SERVICE CARD

MARKING METAL?

Blaisdell markers do the trick

CHINA-MARKER

Unsurpassed for bold, bright marking on all surfaces. Strong and durable—adheres firmly—14 vivid colors.

OMNIMARK—Thinner diameter lead for fine line marking.

DU-ALL MECHANICAL PENCIL

Convenient propel-repel action. 8 brilliant, all purpose leads with barrels to match.

AT BETTER STATIONERS EVERYWHERE

Test the marker that suits your needs. Send for sample naming this publication.

blaisdell PENCIL COMPANY BETHAYRES, PA.

NAMES IN THE NEWS...

of sales engineering for special automatic processing and assembling machines. Prior to joining the firm, Mr Lewis was manager of Multra Corp, Stamford, Conn.

Dwight W Kaufmann has been appointed manager of tool steel sales for Crucible Steel Co of America. He succeeds **A H Lewis,** named assistant to the works manager of the company's Sanderson-Halcomb plant in Syracuse, NY.

Fred G Outcalt has been appointed sales manager, Linde Department, Union Carbide International Co, Division of Union Carbide Corp. He was formerly assistant manager of the Electric Welding Department.

Robert DeDobbelaere has been appointed product sales manager, carbide tools, for the Abrasives Division of Elgin National Watch Co. He has been associated with the company in sales positions since 1952.

Robert E Reilly, Washington representative of E W Bliss Co, has been named to head a new sales organization set up by the company to handle special products and government contracts.

Langdon C Schaefer has joined Century Electric Co, St Louis, as manager of engineering. He was formerly engineering manager of the Westinghouse Small Motor Division in Lima, Ohio.

Ralph A Purcelli, executive assistant to the general manager of Rockwell Manufacturing Co's Barberton, Ohio, plant, has been named general manager of the Porterville, Calif, facility.

OBITUARIES

Henry B Austin, vice president, sales, of Armstrong Bros Tool Co, Chicago, died Feb 26.

James S Knowlson, 75, board chairman of Stewart-Warner Corp, Chicago, died March 6.

NEW BOOKS...

ARC WELDED PROJECTS FOR THE SCHOOL SHOP—*By William A Sellon, Bermidji State College, Bemidji, Minn. Published by James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio. 46 pages, 8½x11. Price 50¢.*

Published as an aid to arc welding practice in industrial arts shops and as a stimulus to welded project design, book contains information for making 25 useful and interesting projects. Photograph, bill of material, construction suggestions, and detailed plans are given for each. Projects have all been constructed in school shops and were selected on the basis of general interest for the student, welding practice involved, degree of complexity, and quality of design.

Projects range from a simple foot scraper to a table saw, and cover household, yard, and sport equipment as well as shop tools. An extensive bibliography lists other projects that have been published in books and periodicals since 1947.

•

MAINTENANCE HINTS—*Published by Westinghouse Electric Corp, PO Box 2099, Pittsburgh 30, Penna. 650 pages, 5x7. Price $2.*

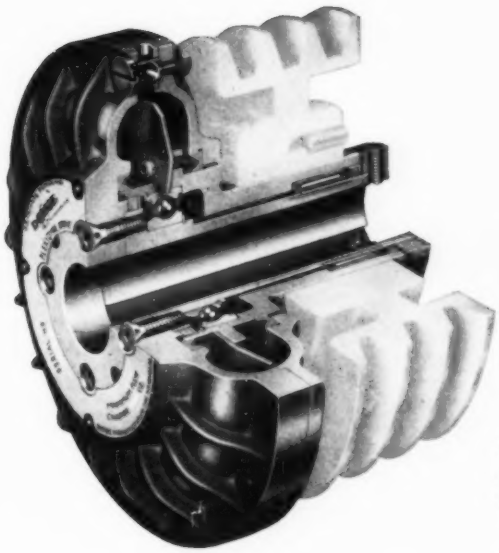
New 24-chapter leatherette-bound manual is designed to provide a quick, complete, and convenient guide to modern maintenance practices on all types of electrical equipment.

Divided into two sections, the first 17 chapters cover specific apparatus

"Well, the efficiency consultants you retained have tracked down what's wrong around here, B. J., and . . . well . . . I'm afraid you aren't going to like this . . . but . . ."

WHAT'S YOUR PROBLEM?...

- ☑ Overheated motors?
- ☑ Excessive belt maintenance?
- ☑ Breakage of materials being processed —like thread, wire, paper?
- ☑ Expense of oversize or high torque motors?
- ☑ High demand rate?
- ☑ Expense of reduced voltage starters?
- ☑ Clutch trouble?
- ☑ Breakage of transmission parts due to instantaneous shock loads?
- ☑ Damage and recurring down-time from overloads?



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THE DRY FLUID DRIVE

It is no longer necessary to accept the destructiveness—the costliness—of conventional starting in the mechanical transmission of power. Flexidyne changes that!

Flexidyne is the new way to start loads *smoothly*—to protect against shock and overload—to save power—all *without any sacrifice of efficiency at full load!*

This revolutionary development is ushering in "the day of the soft start"—which can mean thousands of dollars to you in equipment savings and in better, more economical operation.

Flexidyne is available, off the shelf, in Drives and Couplings. Capacities range from fractional to 1,000 hp. Ask your local Dodge Distributor or write us for technical bulletin.

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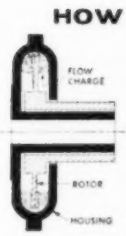
HOW FLEXIDYNE WORKS



The "dry fluid" in Flexidyne is tiny heat-treated steel shot. A measured amount, called the "flow charge," is contained in the housing, which is keyed to the motor shaft. Inside the housing is a rotor, free to revolve relative to the housing, but connected to the load.

When the motor is started, centrifugal force throws the flow charge to the perimeter of the housing, packing it between the housing and the rotor, which transmits power to the load. Initial slippage is momentary. Housing and rotor become locked together and achieve full load speed without slip and at 100% efficiency.

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Produced in a full range of sizes and capacities from ¼ h.p. to 15 h.p. Bulletins available on other MAXITORQ products: Floating Disc clutches and brakes, Electric clutches, Overload Release clutches, low-cost Single Disc clutches, and clutch or brake friction discs. Write Dept. AM-4.

THE CARLYLE JOHNSON MACHINE CO.
Manchester, Connecticut

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mainenance; the last seven, general maintenance of materials used in apparatus, such as insulation. In addition to updating of all chapters, this new edition contains a chapter on maintenance of static controls, the first information published in a general handbook. Chapters on electronics and electric brakes have been considerably altered and enlarged.

•

POWER PRESS SAFETY MANUAL—*Published by National Safety Council, 425 N Michigan Ave, Chicago 11, Ill. 96 pages.*

"If your organization maintains even one power press of any size and type," says the Council, "this handbook deserves a place on your accident prevention reference shelf."

Manual, containing 45 illustrations, was written by members of the executive committee of the Council's power press and forging section. It covers power presses from basic construction to maintenance, with chapters on why a guarding program is necessary, functions of parts, training, and automation.

•

FLUID-POWER CONTROLS—*By John J Pippenger, vp, Double A Products Co, and Richard M Koff, senior associate editor, Product Engineering. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36. 252 pages. Price $9.00.*

This book started as a series of articles on hydraulic controls in *Product Engineering*, from which the book has been expanded and completed. Perhaps for this reason the book is more carefully written than many technical books. The text is detailed and technical, but not too wordy or loaded with vague qualifying phrases.

Illustrations are top-notch; mainly drawings, plus some photos. These, too have been carefully edited to show clearly the points under consideration, no more.

Pumps, valves, and other features of hydraulic circuits are covered in considerable detail. These are described and also qualified to give the reader a good idea of why and where each kind of unit may be best applied. All of the general types of fluid-power controls are covered, from simple to complex. At the end of the book are sections on maintenance, graphic symbols, JIC standards, and a glossary. It is a useful book.

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Cost-cutting Tubular **SPEED CLIP®** takes positive "bite" to hold assemblies tight!

In seconds, you can front-mount trim, name plates, grilles, knobs, insulation, with Tubular SPEED CLIPS. And at interesting savings in assembly time and costs!

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As the SPEED CLIP is inserted, spring fingers compress, then expand behind the panel to lock tight. The rolled-in end permits easy entrance, but bites hard into the stud to prevent back-off or vibration-loosening.

Tubular SPEED CLIPS are available for a full range of stud sizes and panel thicknesses. Permanent lock or removable types.

Check your Sweet's Product Design File (Section 8/Ti) for data on Tubular SPEED CLIPS and other SPEED NUT brand fasteners. Then call your Tinnerman representative for samples and additional information. If he isn't listed under "Fasteners" in your Yellow Pages, write to:

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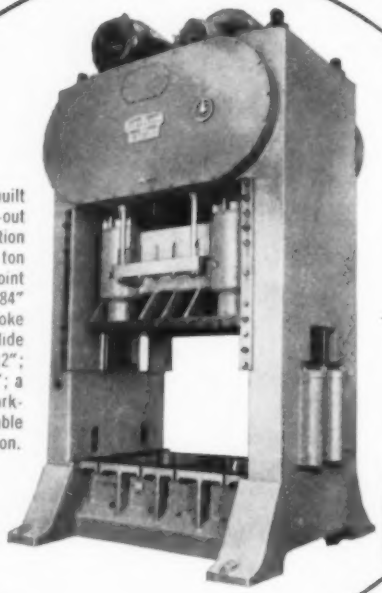
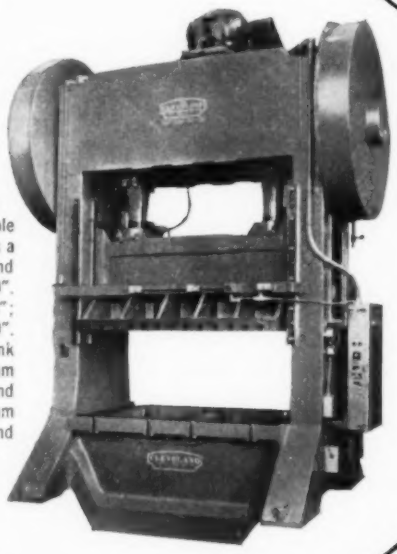


Ruggedly built for day-in, day-out steady production—this 400-ton Cleveland 4-point Press has a 60 x 84" bed area; stroke of slide, 18"; slide adjustment, 12"; shut height, 54"; a dependable work-horse for profitable production.



This 300-ton Straight-Sided Double Crank Press has a 60 x 84" bed area and shut height of 40". Stroke of slide, 18"; Slide adjustment, 10". This double crank press offers maximum accuracy and die life—minimum maintenance and per-part cost.

SINCE 1880

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Pioneers in Cost-Cutting Metalworking Presses, Fabricating Tools.

Here's how they pay for themselves!

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INCREASED PRODUCTION • ECONOMY OF OPERATION • MINIMUM MAINTENANCE

Each of these Cleveland Presses features the patented Cleveland Drum Type Friction Clutch—easily adjusted, uses less power, assures minimum down-time. For lower operating costs, it provides quicker starting and stopping to boost production.

For proven metalworking economy, Cleveland has 12 different types of presses: Inclinable, Horning, Gap, Trimming, Knuckle-Joint, Toggle, Straight Sided Crank, Straight Sided Eccentric, Single Point, Two Point, Four Point, and Four Point Underdrive—each in a wide range of capacities, bed areas, stroke of slide, etc. Investigate how you get BETTER stampings for LESS with a Cleveland Press.

AA-9518

This Cleveland 200-ton Straight Sided Single Crank Press is ruggedly built to meet your trimming, blanking, drawing and other press needs. Bed area, 42 x 36"; stroke of slide, 12"; slide adjustment, 6"; shut height, 26".

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Established 1880

Power Presses
Fabricating Tools
Punching Tools & Dies

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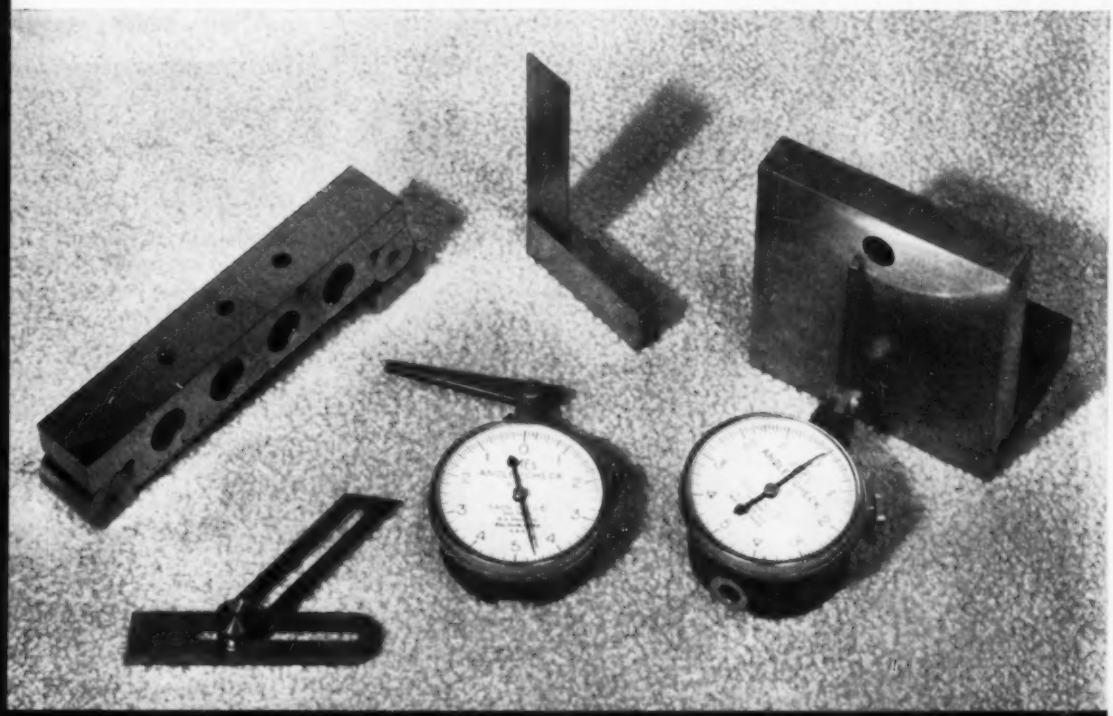
Check Angles Quickly and Precisely with the New



AMES DIAL TYPE ANGLE CHECK®

ANGLE CHECK, a new dial type measuring instrument, offers you a fast, inexpensive and extremely accurate method for checking all types of angular parts.

ANGLE CHECK is available in two models: Model V for vertical work and Model H for horizontal. Either model will accommodate any AMES 200 Series back. Contact blades can be specified in various shapes and lengths to meet your exact requirements.

Built to give long, trouble-free service, ANGLE CHECK will save hours in checking predetermined angles on simple and intricate shapes. Set ANGLE CHECK to master, protractor or sine bar.

The contact blade can be set simply and quickly without tools to a predetermined angle with the dial "0" under the indicator hand. A range of 10°—from 5° minus to 5° plus—in increments of 5′ can be obtained. ANGLE CHECK is accurate to 5′. Write today for complete information.

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NOW you can get a boring head that will BORE, FACE, TURN and GROOVE at no more cost than you would pay for a plain, single purpose boring head.

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COMBINED BORING AND FACING TOOLHEADS

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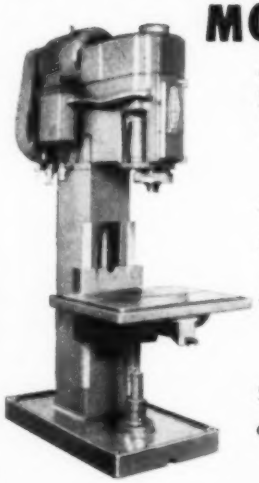
FOR HIGH SPEED PRECISION TAPPING *CHOOSE THE* KAUFMAN

MODEL 10E-20



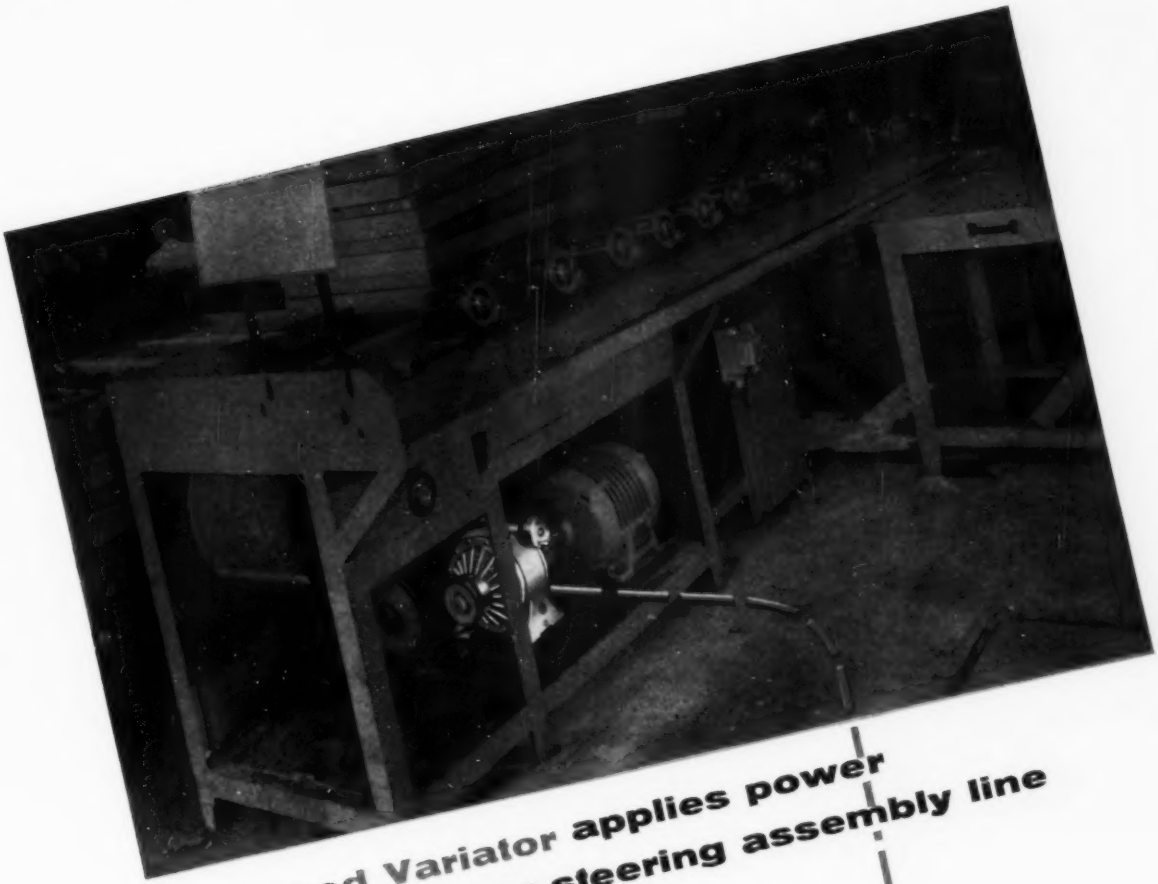
Check these six features of this new, precision-built Kaufman Tapping Machine:

1. Lead screw control for accurate threads and maximum tool life. Maximum 4½" lead screw travel.
2. Rapid approach of spindles to work.
3. Clutch operated for faster operation — Reversing spindles at twice forward speed.
4. Six speed transmission providing spindle speeds of 80-350 RPM with 3-1 ratio or 160-700 with 1½-1 ratio clutch.
5. Units provided with 5-7½-10 H.P. motors.
6. Speeds and H.P. available for highly efficient tapping from 5/16" through 2" NC taps or smaller taps with use of multiple head.

For additional information about the new Model 10E-20 or other Kaufman machines for single or multiple operation, write or telephone:

KAUFMAN MFG. CO.
543 S. 29th Street. Manitowoc, Wisconsin

CIRCLE 342 READER SERVICE CARD



Cleveland Speed Variator applies power to power-steering assembly line

Providing variable speeds to the final inspection and assembly conveyer on a power steering gear generator line is a Cleveland Speed Variator. This Cleveland was chosen for its infinitely variable speeds which enable management to obtain a desired number of units per day by merely selecting a suitable conveyer output speed.

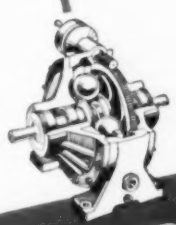
One of 22 Variators in the plant, this installation of a Cleveland Speed Variator has a side benefit to labor and management by eliminating problems stemming from disputed conveyer speeds.

Other advantages of Cleveland Speed Variators include: 1. Clockwise or counterclockwise input speeds to 1800 rpm; 2. Constant horsepower output over a 9:1 range, or constant output torque over a 6:1 range; 3. Rapid response to speed changes, precise adjustments, accurate adherence to settings; 4. Long life with minimum maintenance; 5. Ample bearing support for overhung pulleys on either input or output shafts; 6. Compact design.

Write today for illustrated Bulletin K-200 for complete specifications, sectional drawings and rating tables on the full line of Cleveland Speed Variators.

The Cleveland Worm & Gear Company, Speed Variator Division, 3254 East 80th Street, Cleveland 4, Ohio.

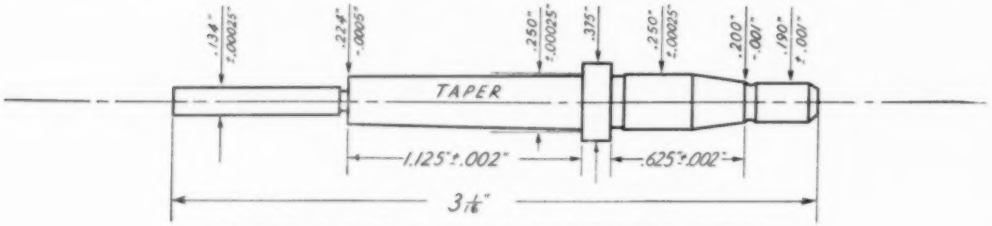
Subsidiary of Eaton Manufacturing Company



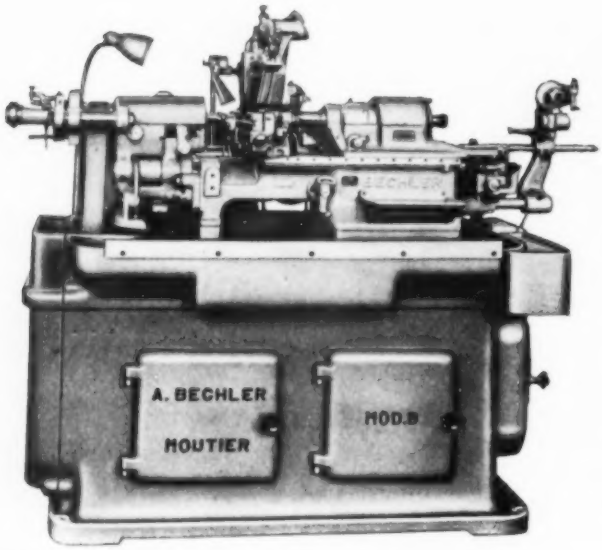
CLEVELAND SPEED VARIATOR

CIRCLE 343 READER SERVICE CARD

It's a Natural for BECHLER AUTOMATICS



SHAFT MADE OF 416 STAINLESS STEEL



Model B-20 BECHLER AUTOMATIC has 3/4" diameter capacity, 3" turning length with flat cams, 5 3/4" with bell cams, 5 cross slides and combined centering—drilling—threading (tapping) attachment.

When parts are too long or slender and tolerances too tight to produce on regular screw machines, BECHLER SWISS AUTOMATICS will do the job *Quickly, Accurately and with exceptionally high surface finishes.*

Send us prints of your parts, our Engineers will recommend the machine and tooling best suited for the job.

DIAMETER CAPACITIES

BECHLER AUTOMATICS

Model AS	5/64"	5/32"	9/32"	3/8"
Model A	—	5/32"	9/32"	3/8"
Model B	1/2"	5/8"	3/4"	—
Model C	1"	1 1/4"	—	—

BECHLER ISOMATICS

Automatics for constant and highly accurate production of very small parts.

Model AS	5/64"	5/32"	9/32"
Model A	—	5/32"	9/32"

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Johnson ALUMINUM BRONZE Bars

If you have a tough application for bronze metal, **Johnson Aluminum Bronze Bars** are the answer.

Now Johnson offers aluminum bronze bars that provide many *cost-saving* advantages in a wide range of applications.

Compact grain structure and the unusual alloy in these bars result in high physical properties that greatly increase service life and cut down-time to the bone. Resistance to wear and fatigue is exceptional. Quality is uniform—no inclusions, no porosity, no undersurface defects.

Johnson's solid aluminum bronze bars are supplied with extruded finish. Centrifugally cast bars are semi-finish machined on the ID and OD.

Both bars are supplied in standard 12½-inch lengths and in 97 sizes up to 8-inch OD. This allows for saw cut, in equal divisible lengths, with almost no loss in metal.

Johnson Aluminum Bronze Bars are ideal for such applications as gears, worms and worm wheels, valve seats and guides, hydraulic valve parts, plungers, pump rods, guide pin bushings, special bearings and many others.

Immediate delivery can be yours from the wide range of sizes carried in stock of both solid and centrifugal bars. For additional information and quick service, call your Johnson distributor or write for new literature today.

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JOHNSON Bearings

GRAPHITED
over 175 sizes

GENERAL PURPOSE
over 900 sizes

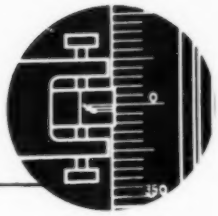
UNIVERSAL BRONZE BARS
over 400 sizes

POWDER METALLURGY
over 400 sizes

ELECTRIC MOTOR
over 350 sizes

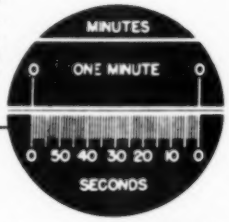
WORLD'S MOST ACCURATE DIVIDING HEAD

Graduated hand disc for initial rough setting to nearest increment of 20 minutes.



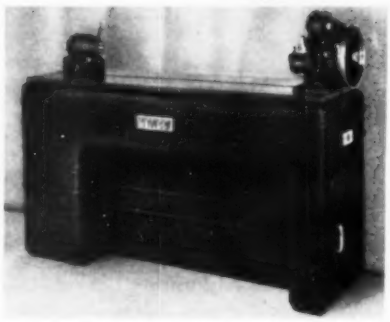
Rotary master disc and fixed auxiliary disc have lines diamond scribed within .000025" of true position. Visible through 40 power scope.

Upper micrometer thimble is divided into 10 minutes of arc. Lower barrel has divisions of both 60 and 10 spaces per minute.



Vinco Optical Master Inspection Dividing Head

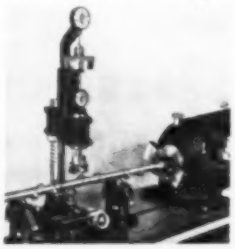
For 20 years, the national standard for precision angular measurements and the most accurate industrial turntable. **GUARANTEED ACCURACY:** spindle runout, 25 millionths of an inch (average 15 millionths). • **TOTAL ACCUMULATED ERROR:** 2 seconds of arc (± 1 second). *One second is 1,296,000th part of a circle.* • **MEASURING INCREMENTS:** any required amount of degrees, minutes and seconds. • **APPLICATIONS:** measurement of gear and spline spacing, bore relationships, calibration of index plates, involute and master involute profiles, inspection of any type cam, etc. Years of normal usage will not, and have not altered the extreme accuracy of these instruments.



Standard optical dividing heads are available with 20" x 40" or 20" x 72" surface plates of either cast iron alloy or granite. The heavy duty model has a surface plate, cast iron or granite, 36" x 72". Surface plates are hand scraped, have a flatness accuracy of .0002" and are provided with a precision keyway for perfect alignment of tailstock to dividing head.

NEW VERTICAL SPINDLE OPTICAL DIVIDING HEAD

This new instrument embodies the same proven design as the popular standard model, is equipped with a 30 inch diameter turntable and a swivel measuring head. It accommodates larger parts in horizontal position and performs essentially the same inspection functions as the standard model. The measuring head provides readings in increments of .0001".



CAM RISE GAGE measures linear rise or fall of peripheral cams and camshafts within .0001", is available in two sizes, 6" or 9" swing. Special adaptations can be made.

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"When we brought out two new product lines last year, I convinced management that we ought to automate machine operations so we wouldn't have to take on a lot of new help. The new set-up is really paying for itself. Got the idea from an article I read some time ago."

You hear that kind of observation again and again from Metalworking production men. In today's fast-moving economy, emphasis is on increased output and lower costs. Keeping up with what's new – and what's coming – is a must for the engineers and executives who guide production in the $120 billion Metalworking industry.

That's how American Machinist works for these men. Whether their jobs are behind a desk, in front of a drawing board or bossing the crew on the shop floor, American Machinist helps them do their jobs better. Thus, more of them subscribe to it than any other Metalworking publication. It's the "most useful" magazine in the field. That's why, in Metalworking plants, production men will tell you . . .

"I have to read American Machinist"

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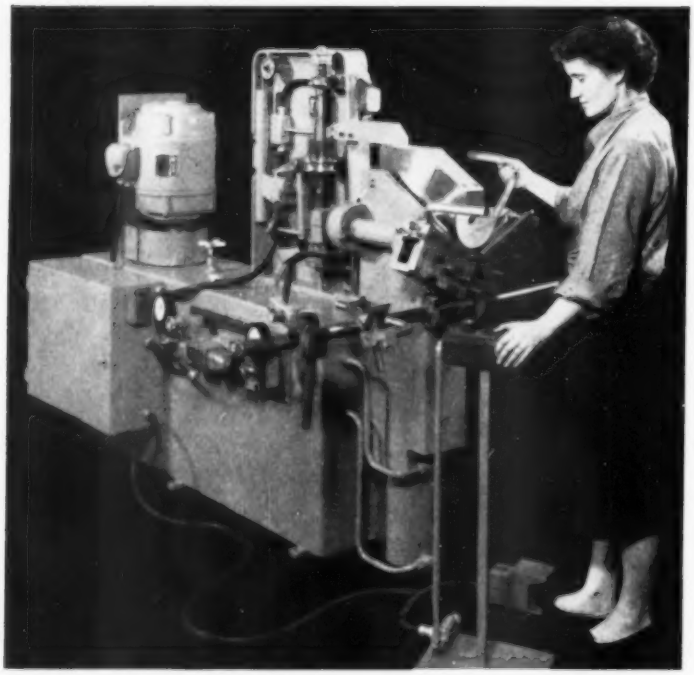
NEW PINES 3T PRESS

Cuts Bending Costs AS MUCH AS 50%



COMPLETE LINE OF BENDING PRESSES

In addition to the Model 3-T, Pines also builds the larger bending presses, illustrated below, which are also establishing outstanding performance records.

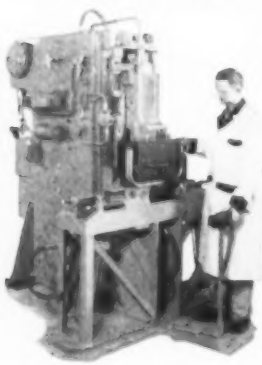
Makes Bends Progressively to Varied Angles In Multiple Planes 2 to 3 Times Faster

Quality bends at production speeds that are 2 to 3 times faster than conventional methods, are now possible with the new Pines 3-T Bending Press. Many tubular parts in sizes up to 1" O.D. are now formed at net speeds of over 1000 bends an hour. Up to 9 different bend angles can be produced in a single setup. Adjustable automatic indexing stops accurately control depth of ram stroke. Open tooling area permits rapid progressive bending in varied planes.

Wing Die Design Assures Quality Bends

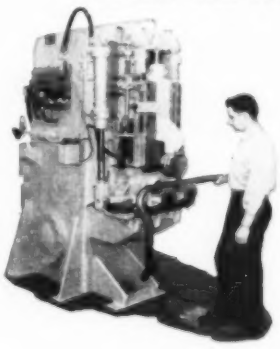
High production speed is just part of the story. Unusually smooth, good looking bends are produced to meet the quality demands of automotive, furniture, toy, office equipment, and appliance manufacturers. Wing dies of the press are designed to move in ways as a bend is made, and their pivoting action is hydraulically cushioned through bearing-mounted rocker arms. This principle eliminates scratches or draw marks and produces wrinkle-free bends with very little distortion. Get the complete story on cost cutting advantages of this new Bending Press today.

MODEL 6T FOR MULTIPLE U-FRAME BENDING



Makes two bends of the same or slightly different angles in each of two or more tubes simultaneously. Production of four or more bends with each stroke makes it possible to form 1700 to 3000 bends per hour in tube sizes ranging up to 1" O.D. x .065". When necessary, retractable ram dies are used to release pieces from die grooves. Like 3-T, wing dies move with work, eliminating draw marks, producing bends of superior quality.

MODEL 1900 FOR PROGRESSIVE BENDING OF TUBES UP TO 2" O.D.



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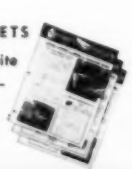

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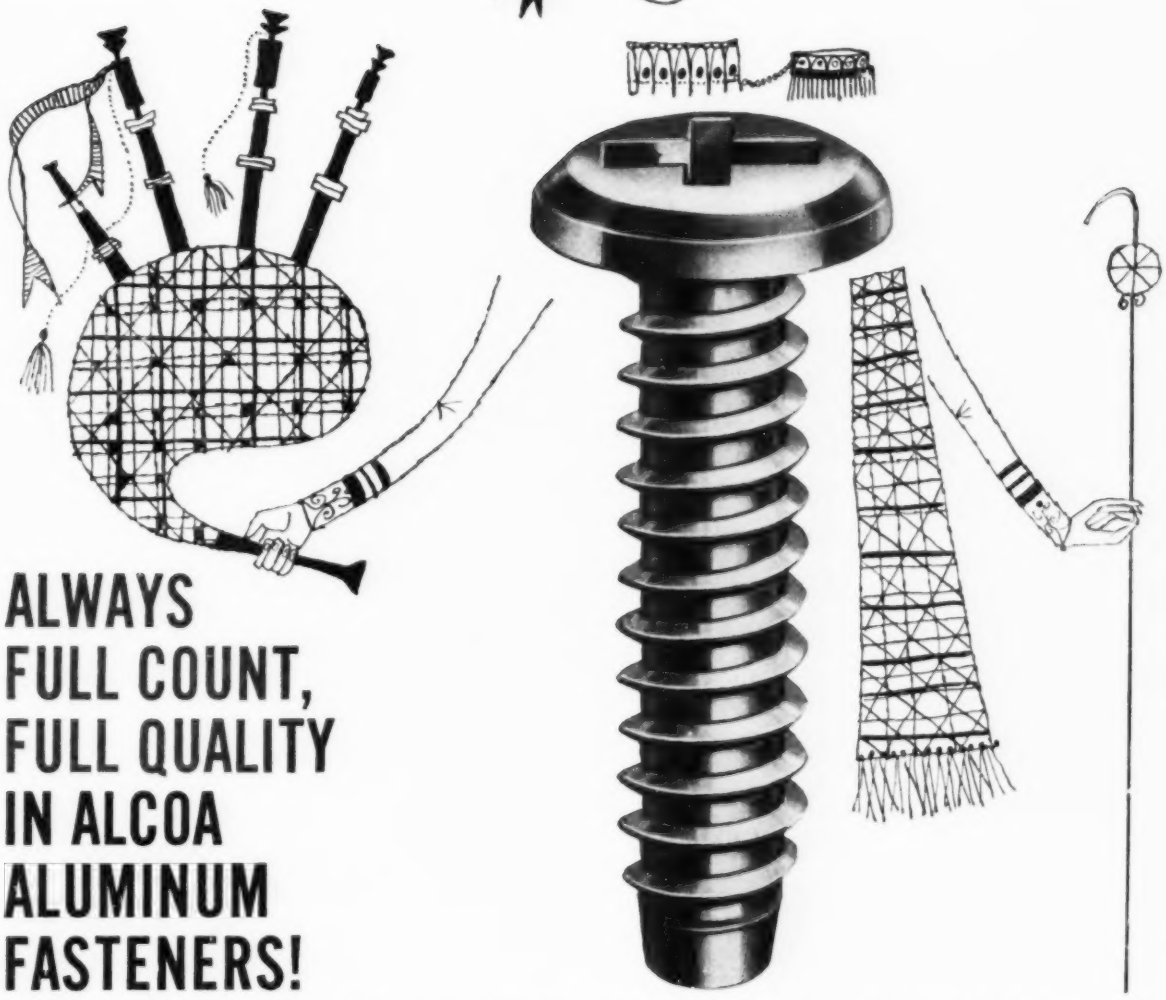

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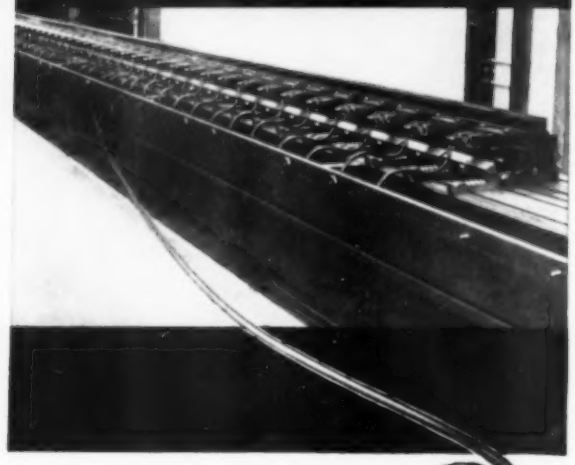

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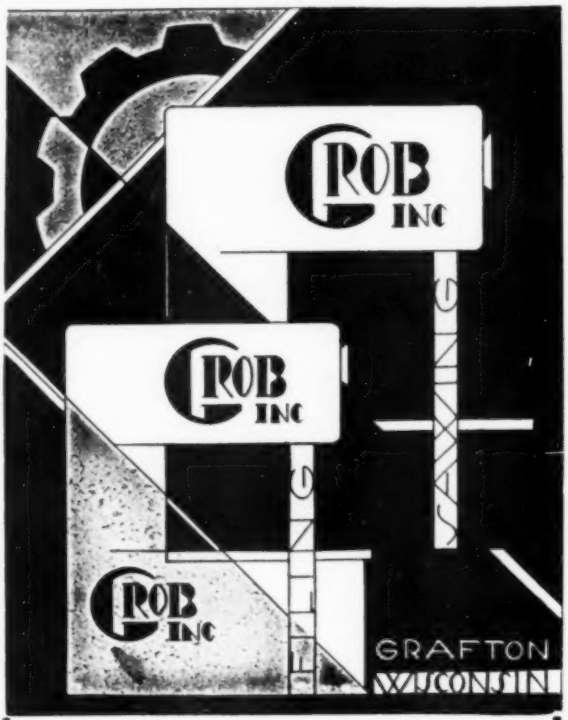

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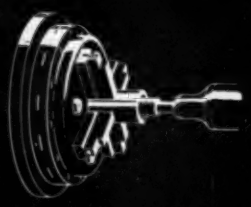

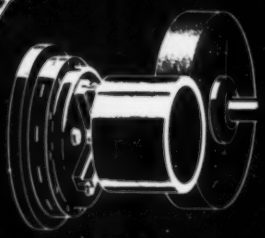

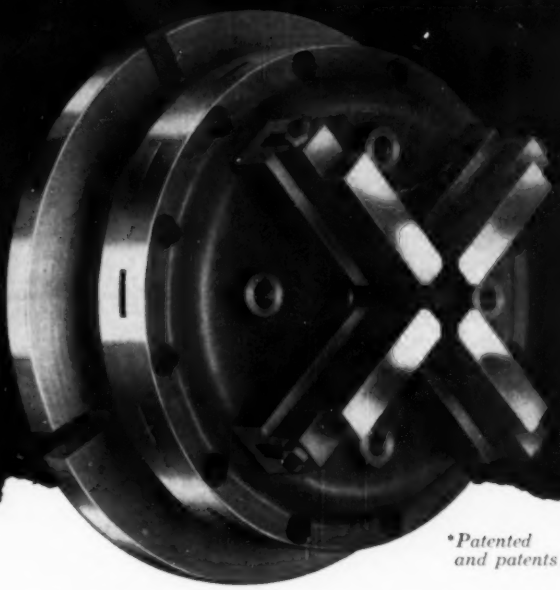

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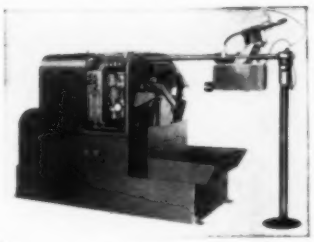

CATALOG

Has complete specifications of all models. Illustrates parts that are being formed, grooved, flanged or chamfered and cut off in a single operation at a high rate of speed. Also describes the automatic feeder, hot spinning machine for sealing ends of tubing, and the Modern Safety Drill Table.

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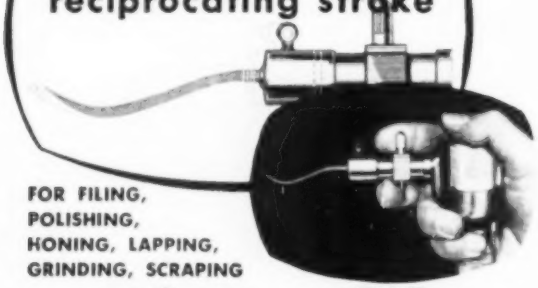

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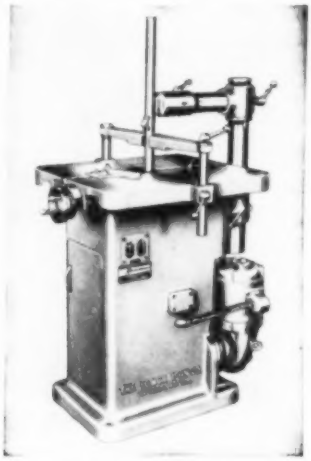

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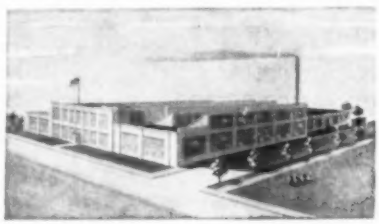

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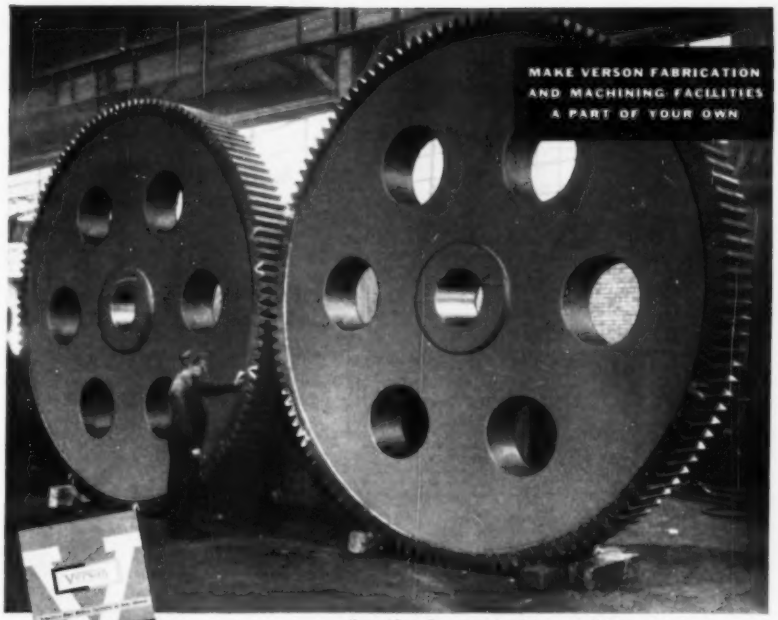

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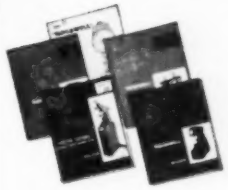

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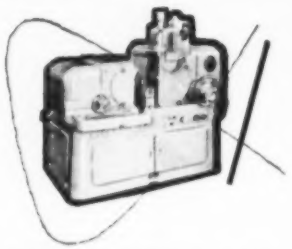

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LATHES, ENGINE, 13", 19" & 17" LeBlond
MILLER, AUTO. 2-20 Kent Owens, 1942
MILLER, AUTO 36" No. 85 Sundstrand
MILLER, DUPLEX, 4-40 Cincinnati 1945
MILLER HAND, No. 2RV Kent-Owens, 1942
MILLERS, No. 10 & 3 VanNorman Duplex
MILLER, PLAIN, No. 2 Cincinnati HSDT, 1940
MILLER, PLAIN, No. 3H K & T MSDT 1943
MILLER, VERT. No. 2 B & S HSDT, 1943
MILLER, No. 80 VanNorman, ram type, 1942
MILLING MACHINES, HORIZONTAL, No. 5H Kearney & Trecker, plain with Vert. Hd., 1941
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The numbers after the advertiser's name, indicates the products or services offered by the advertiser.

3. Balancing Machines
6. Boring Mills
9. Centering Machines
10. Chucking Machines
16. Drilling & Reaming Machines
20. Forging Equipment
22. Furnaces & Ovens
24. Grinding Machines
29. Lathes
33. Milling Machines
40. Press Brakes
41. Presses
50. Shears
51. Shapers
52. Sheet Metal Machinery
56. Threading Machines

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Wender Presses Inc.	247	41

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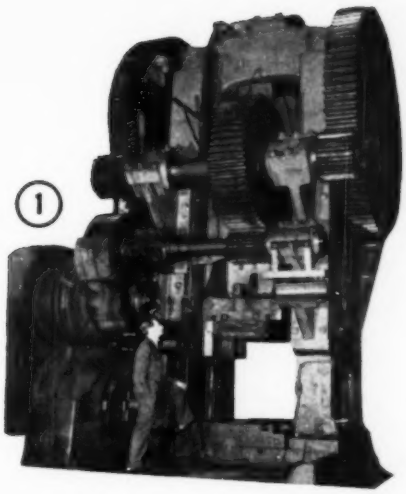

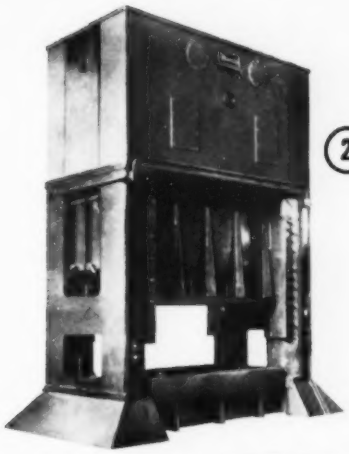

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None	580/390	Bliss	216	Double Action	54x54	40/25"
None	550	Toledo	59¼	SSSC	41x40	8"
6	525	Bliss	10G	SSDC	167x48	20"
7	325	Elmes	Hydr.	4Pst	54x32	42"
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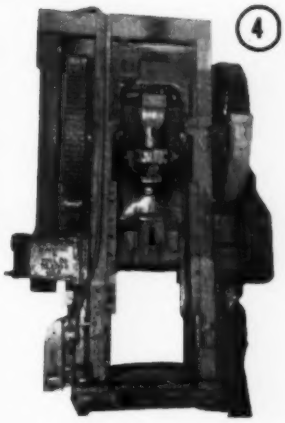

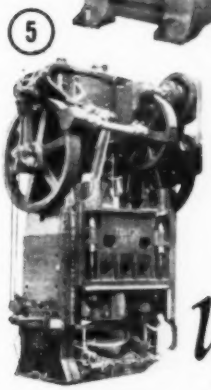

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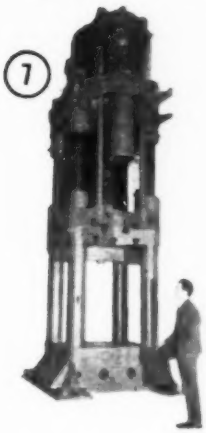

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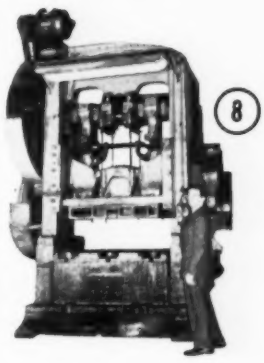

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No. 1S-25 Acme Saddle Type, m.d.
No. 1L Gisholt Universal, m.d., 1943
No. 2 Bardons & Oliver Ram Type Electric, m.d.
No. 2A Warner & Swasey, 1946
No. 2H8, Libby, 1942
No. 3 Gisholt, m.d., 1945
No. 3A Warner & Swasey, m.d.
No. 3 Bardons & Oliver Ram Type, flanged m.d.
No. 3L Gisholt, m.d., 1943
No. 3AL Gisholt, with cross sliding turret, 1940
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No. 4 Warner & Swasey Universal Ram Type, m.d.
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No. 4A Warner & Swasey Universal Hollow Hexagon, m.d.
No. 4A Warner & Swasey Universal, m.d., chucking, 1939
No. 4L Gisholt Universal, m.d.
No. 4FU Foster Fastermatic, m.d., latest, 1945
No. 4H-12 Libby, m.d.
No. 4R Libby Ram Type, m.d. in base
No. 5 Midland, m.d.
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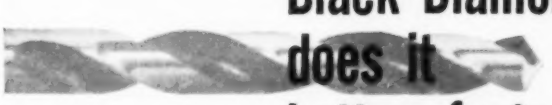

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Makers of Dial Gages Since 1898

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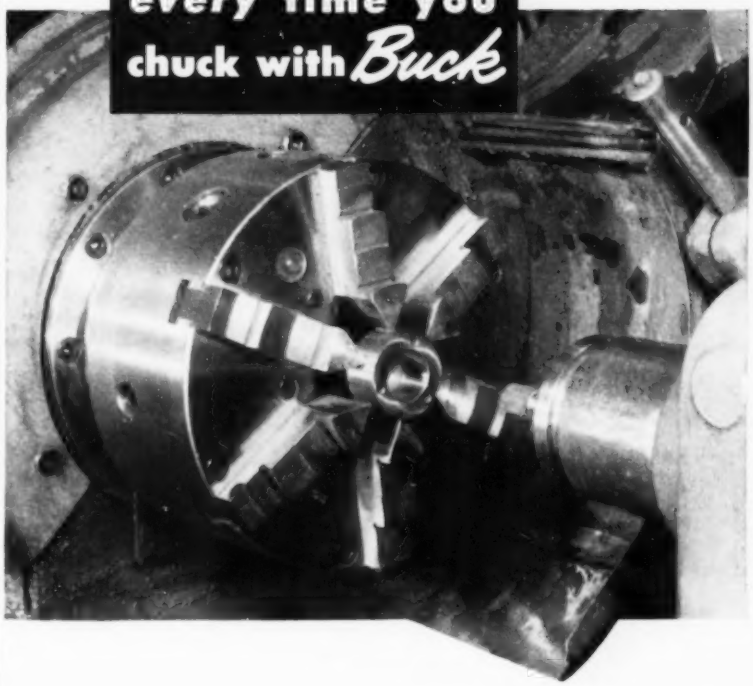
YOU make money every time you chuck with *Buck*



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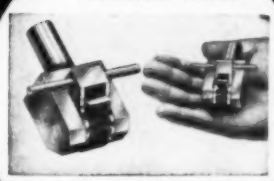

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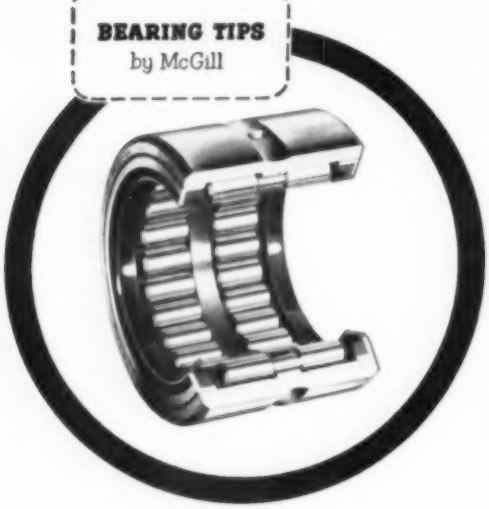


McGILL sealed GUIDEROL® bearings preserve high capacity performance of needle bearing applications

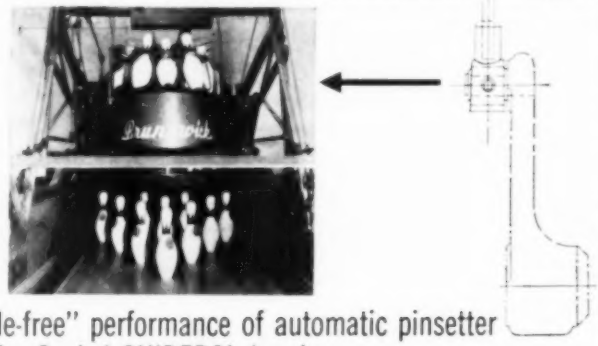
Lip type contact seals built into GUIDEROL bearings insure longer life for their high capacity performance in limited radial space. It's simpler and less costly to apply these sealed bearings than build in auxiliary seals that increase bearing width and housing requirements.

GUIDEROL bearings, including the sealed series, are precision built and combine the inherent high capacity of full complement roller bearings with the control of center guided rollers. This recommends the bearing for applications too heavily loaded for retainer type bearings, but where shaft deflection and misalignment prevents the use of ordinary full type roller bearings.

Seals keep contamination out and lubrication in. This assures trouble free performance where maintenance is costly or impractical.

Sealed GUIDEROL minimizes torque in ACF "Piggy-Back" trailer hitch

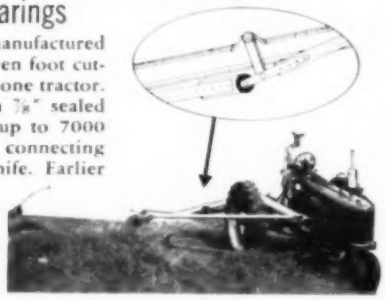
McGILL Sealed GUIDEROL bearings meet the requirements of a high capacity needle bearing for small radial space, having adequate seals to prevent entry of foreign materials and loss of lubricant in this exposed application. The bearings, in the elevating arms, minimize the amount of torque required to elevate the trailer hitch and jack the trailer off the car floor. The hitch, manufactured by American Car and Foundry Division of ACF Industries Incorporated, is a tiedown and cushioning unit for semi-truck trailers on flat car (Piggy-back) use. Although speeds are low, loads are as high as 20,000 lbs. per bearing. Grease relubrication when desired is applied through the shaft to the inner race of the bearing.



"Trouble-free" performance of automatic pinsetter called for Sealed GUIDEROL bearings

Prelubricated and Sealed GUIDEROL bearings are used in two applications in BRUNSWICK AUTOMATIC PINSETTERS; on the Rake Crank Lever Assembly and on the Jogger Arm Assembly. The photo shows the location of the sealed GUIDEROL Rake Crank Lever application in the "mechanical brain" of the machine. The sealed GUIDEROL bearings help keep the "brain" highly efficient, with a minimum of maintenance. In the Rake Crank they are not relubricated and operate indefinitely on retained lubricant. Effective seals keep out dirt and foreign matter.

New mower design takes high cutting loads on Sealed GUIDEROL bearings



These unusual field mowers manufactured by Kosch Mfg. Co. use two seven foot cutting bars for a 14 foot cut with one tractor. The second bar depends on a 7/8" sealed GUIDEROL bearing to carry up to 7000 pound loads produced in the connecting drive for the reciprocating knife. Earlier sleeve and lower quality needle bearings were discarded for sealed GUIDEROL bearings that have prevented costly field breakdowns.

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It is this standard — which has as its aim the realization of Full Press Room Profit for you — that dictates the manufacture and performance of every piece of U. S. Press Room Equipment.

For example, U. S. Slide Feeds are precision built units for the accurate feeding of coil stock into punch presses. They are adaptable to the feeding of one or more separate strips of wire or flat stock, either of regular or **irregular cross section.**

U. S. Flat Stock Straighteners and Two-Way Wire Straighteners are perfect complements to U. S. Slide Feeds. When teamed together they guarantee accuracy and contribute to prolonged die life.

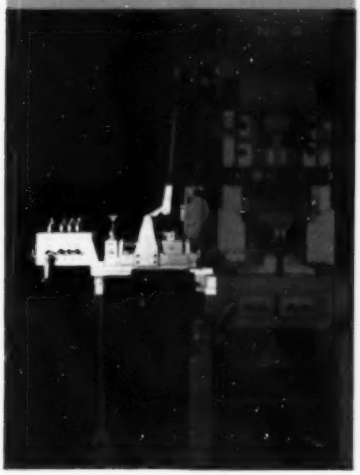
Write today for U. S. Bulletin No. 85A and learn how you can obtain maximum flexibility and efficiency for your present Press Room equipment — to give you your "F.P.P."

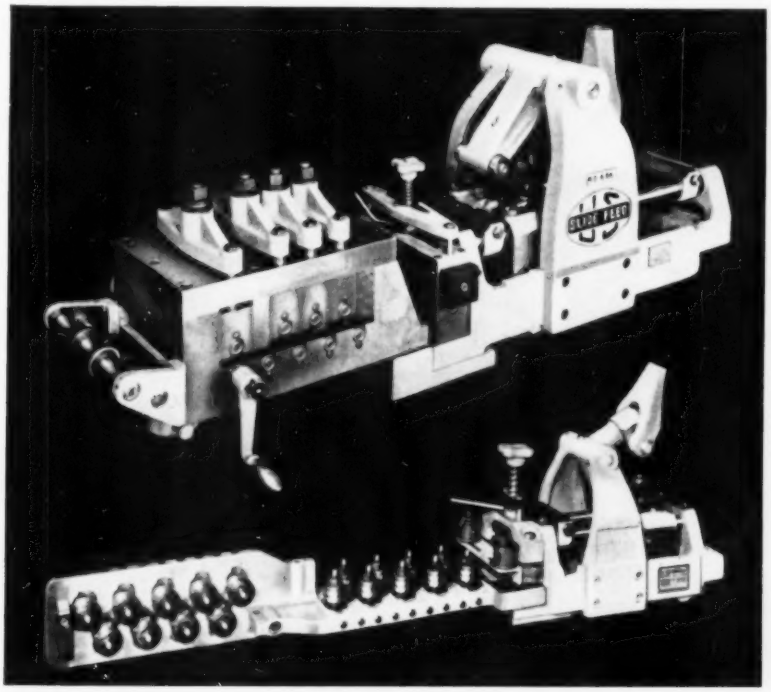
Some typical stock cross-sections readily accommodated by U. S. Slide Feeds.

Below: **SF-1 U. S. Slide Feed with SS-07 Plain Stock Straightener on conventional OBI press.**

Main Illustration Top: **SF-68A U. S. Slide Feed with SS-27 Plain Stock Straightener. Max. width capacity 6" feed length adjustable up to 8".**

Lower: **SF-O U. S. Slide Feed with Two-Way Wire Straightener (nine rolls in each plane).**





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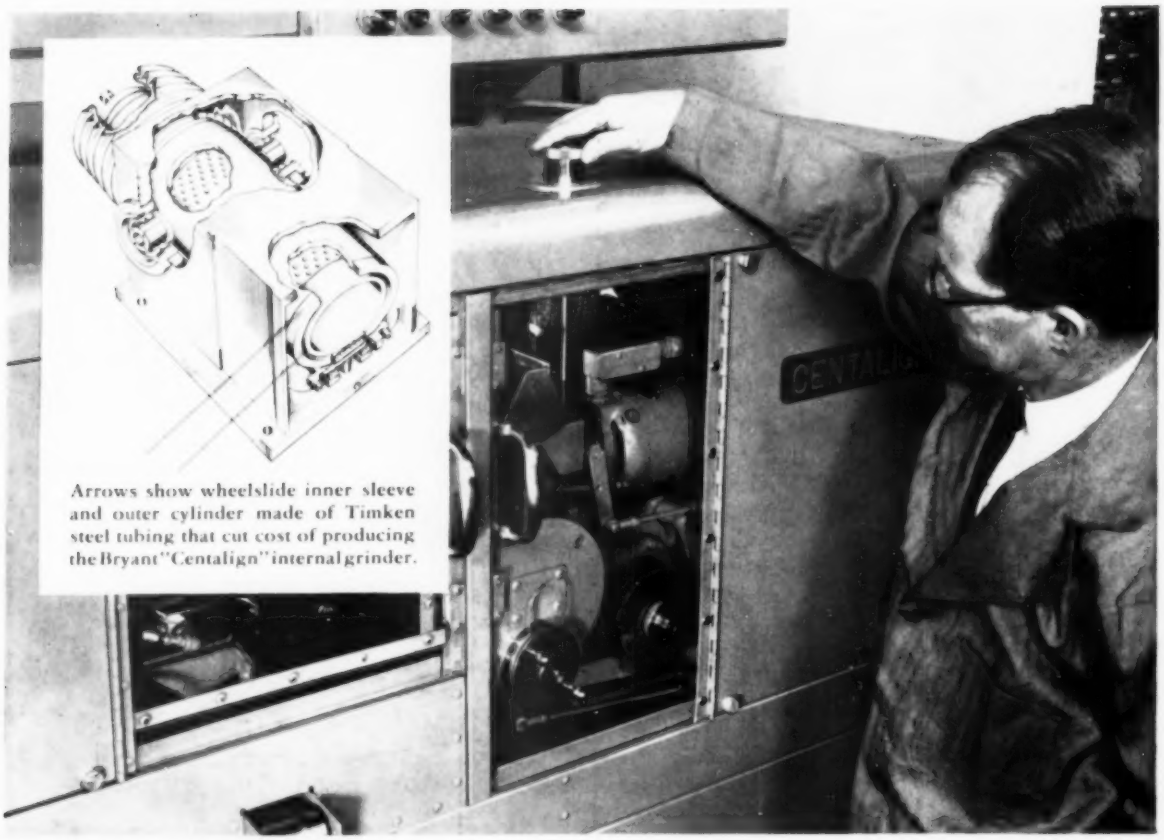

Arrows show wheelslide inner sleeve and outer cylinder made of Timken steel tubing that cut cost of producing the Bryant "Centalign" internal grinder.

BRYANT CHUCKING GRINDER CO.

Saves 45% with switch to TIMKEN® steel tubing

ENGINEERS at Bryant Chucking Grinder Co. wanted to reduce the cost of producing this "Centalign" internal grinder. They blamed high costs on spoilage due to weld checking and excessive machining time of the inner sleeve and outer cylinder of the wheelslide. When they consulted Timken Company metallurgists, these experts studied all angles of the problem. And they recommended a change to a certain grade and size of Timken® seamless steel tubing. Here's what happened.

Because the tubing was perfectly suited to welding, checking was ended. And costly machining time was cut because excessive stock removal was eliminated. The tubing was the right size for the job. They cut production costs 45%! What's more, the tubing had the desired hardness and grinding properties, responded uniformly to heat treatment.

Timken seamless steel tubing gives better quality finished products because of the way we make it. We forge a solid round over a mandrel, thoroughly working the metal inside and out. This rotary piercing operation gives the tubing its fine forged quality and uniform spiral grain flow for extra strength. Careful control keeps this quality uniform from tube to tube, heat to heat, bar to bar.

To help cut costs on your hollow parts jobs, let our engineers recommend the tube size most economical for you. It's guaranteed to clean up to your finished dimensions. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO". Makers of tapered roller bearings, fine alloy steels and removable rock bits.

Timken alloy steel and seamless tubing is available from warehouse stock in 44 cities in the United States. Call your local Timken Company sales office for the name of your nearest Timken steel distributor.

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